CLIL AS A STRATEGY TO FULFILL MATHEMATICS CONTENT AND LANGUAGE NEEDS AT PRIMARY LEVELS: A CASE STUDY AT ASPAEN GIMNASIO LOS CORALES

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Abstract

Content and language integrated learning (CLIL) is a worldwide recognized approach that has been implemented in different schools as a way to help learners become skillful in terms of content while improving language proficiency in a natural way, since the language becomes a vehicle to understand the content. In 2012, CLIL was implemented as the methodology to teach content areas such as mathematics, science, social studies, and other subjects taught in English at Aspaen Gimnasio los Corales (GLC), a female school located in Puerto Colombia, Atlántico. The school is evaluated yearly by the University of Cambridge, and when CLIL was implemented for the first time, the results in these exams were satisfactory. However, in the last two years, the scores obtained in primary, specifically in mathematics, have decreased.

This situation led the researcher to carry out a case study based on the principles of qualitative research in order to find out how teachers were implementing CLIL to teach their math lessons, how they were teaching general and subject academic language, and how they were teaching the content.

The participants in this research were the three math teachers who taught from first to sixth grade at GLC. These three teachers were observed at least two times, depending on the number of grades they teach in, and interviewed twice. The first to sixth grade mathematics curriculum of the first term was also analyzed.

From the analysis of the data, the researcher concluded that the teachers at GLC attempt to implement CLIL in their lessons. They are very familiar with the stages of a CLIL lesson and are aware of aspects such as scaffolding, feedback, and language through learning. However, they mostly focus their lessons on the teaching of content and need more awareness of the importance of designing language objectives in order to fulfil language needs according to the level and age of the students. This lack of focus on language objectives is also present in the curriculum of the mathematics program.

Key words: CLIL, content, language, mathematics, specific vocabulary, general language, CALP, language for learning, language of learning, language through learning, scaffolding.

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I Introduction

The quality of education is an issue that demands urgent changes in Colombia. The National Plan of Development (PND) 2014-2018, describes how due to poor quality of education, most Colombian students are developing weak competences and deficient lifelong learning skills (Gaviria, 2014). Results in international examinations such as Pisa (2012), which places Colombia in a critical situation compared with the rest of the countries attending these examinations (See Appendix 1), support the idea of starting to be more concerned regarding the quality of education. In order to find a solution to this concern, the government is implementing new policies to improve the standards in education in order to be globally competent; Actions such as the implementation of standardized national assessment (Saber) in third, fifth, ninth, and eleventh grade provide a yearly picture of the education process in Colombia as a way to measure the learning of the students in these globally important issues.

Results obtained from Saber; in primary, middle, and high school demonstrate that it is necessary to consider strategies and definite solutions to improve the quality of education in Colombia. For instance, an important subject such as mathematics, which is internationally recognized as a basic skill for educational processes, usually ranks with low scores in national and international tests. According to the Instituto Colombiano para el fomento de la Educación Superior (ICFES), the historical report in mathematics (from 2005 to 2014) in Saber 11 obtained by students in eleventh grade has been between 45 and 50, in a scale from 0 to 100 (ICFES interactivo, n.d.). These results confirm that in general, most

Colombian students seem to have difficulties in mathematics after completing high school (see Appendix 2).

Although usually most bilingual schools achieve scores above the rest of the national average in most of the subjects assessed by the national tests, there are aspects that should be studied since some standardized international examinations show that compared with the rest of the world, Colombia's performance at primary levels is lower, especially in math. The most recent report of the Cambridge Primary Checkpoints shows this clearly.

According to the May 2015 session, in a scale from 0 to 6, the national average of Cambridge Associate schools in Colombia is 2.5, while the rest of the world is 3.8. Based on the interpretation of these results, Colombia's performance is acceptable, but not good (see Appendix 3).

Aspaen (Asociación para la Enseñanza) Gimnasio los Corales (GLC), a Cambridge associate school supported by the Cambridge International Education program (CIE), has had the opportunity to evaluate progress of its students in mathematics, science, and English with standardized Cambridge examinations through what is called Primary Checkpoints. Since 2013, students from fifth grade at GLC have taken Cambridge Primary Checkpoints. These are exams taken in English, which assess performance according to CIE curriculum in English, math, and science. They provide detailed feedback for students, parents and the school; therefore, it is easy to identify strengths and weaknesses in the different components of each subject. Thus, they are a useful tool which allows the school to adjust syllabi according to the students' academic needs in each of these three subjects.

The analysis of the results of these examinations, taken in about 9,000 schools all over the world, confirm the fact that in 2015 the scores of GLC's students in mathematics continue to be lower (2.1) than most of the students from the rest of the world, and actually lower than Colombia's average in all the components (see Appendix 3).

As part of the certification process to become a Cambridge Associate School, GLC has started a rigorous evaluation of the current curriculum and the predominant pedagogy employed to develop competences and skills required to fulfill the needs aimed for internationalization. With the support of the British Council, in 2012, bilingual teachers started training in Content and Language Integrated Learning (CLIL) as a strategy to achieve the academic learning objectives as well as the language needs required to improve the quality of the programs offered to the students. Therefore CLIL became GLC's strategy to fulfill the academic needs required to improve the quality of the programs implemented, ensuring learning the content as well as the acquisition of language skills in terms of academic and conversational skills.

After the first stage of the training, there was an evident improvement in the pedagogy of teaching mathematics. The students were more motivated to learn the math content and they seemed to be more confident in the use of English as a second language as a tool to understand and communicate learning of the subject. In fact, in 2013, the students from fifth grade took the checkpoints for the first time, and the results have been the best in the history of the school as a Cambridge associate school so far. GLC's result in mathematics was 3.4; while the national score was 2.5 and the international score was 3.8 (see Appendix 3). However, rather than increasing, posterior examinations scores have been decreasing.

There is a clear need to research in order to discover why this phenomenon is taking place at GLC. If implementing CLIL during the first year was successful, why there has been such a contradictory decline in the last two years?

Although most of the math contents seem to be successfully covered at the end of the school year in most of the groups, the results of the examinations demonstrate that the students' performance needs to be improved. They are still showing lacks in terms of higher order thinking skills or subject understanding in all the components. This demonstrates that it is important to inquire into what is really happening in the daily learning process, to verify if the students are learning beyond content, if they are developing specific subject skills as well as enough specific academic and general language fundamental to decode and interpret information and understanding of the logic of mathematics in different contexts. It is vital to ensure that content and language are both being taught because they are crucial for effective learning.

Using CLIL "a dual-focused educational approach in which an additional language is used for the learning and teaching of both content and language" (Coyle, Hood, & Marsh, 2010, p.1) as a teaching alternative to develop language skills as well as cognitive skills is not totally new in Colombia, and it has become more popular in the last decade. As Rodriguez (2011) has stated, "in the Colombian context, this approach is being implemented in different ways. First, some institutions are incorporating the teaching of at least a core area – content learning… Other schools have increased the number of hours of instruction in order to carry out cross curricular projects or, in most cases, students take five to eight hours of language arts, and four hours of science or social studies" (p. 83).

While some research on the CLIL in the primary level in Colombia has been carried out (this will be discussed in the theoretical framework in detail), little research in terms of effectiveness of CLIL in teaching mathematics has been done in Colombia. The fact that Colombian students are being evaluated with standardized national and international examinations and that the results obtained from these examinations demand a serious analysis in terms of competences, methodology, curriculum, teaching and learning practices, academic language, and development of thinking skills support the pertinence of this study since it attempts to identify possible causes of low performance in mathematics at primary levels at GLC. A study that looks at these areas might find possible failures that could be affecting the process of learning mathematics effectively at GLC. Identifying weaknesses in the learning/teaching process may open the door to the design of a future strategic plan which could lead to more successful performance in math.

Thus, this study might be the starting point to consider CLIL as an effective strategy to achieve learning and language objectives required to develop a better understanding of the subject; therefore, it could help first GLC students, then Barranquilla's schools, and finally, Colombian students develop subject language understanding, subject specific competences, and thinking skills required to improve local performance and support Colombian math learners in order to overcome weaknesses in the subject and achieve scores as high as students from other countries in the world.

Research Questions

The research questions and the objectives that guide this study aim at determining what really happens in the daily teaching and learning process in primary mathematics lessons at GLC. The study attempts to collect evidence on how teachers are leading the students' learning process and identify how they are implementing CLIL in the classroom. Therefore, the main research question for this present study is:

How is CLIL being implemented by math teachers at GLC in primary levels?

This research question is followed by several secondary questions:

1. What current methodology do primary math teachers at GLC implement to develop their lessons?
2. How is general language focused in current math lessons at GLC's primary level?
3. How is subject academic language being focused in current math lessons at GLC's primary level?
4. How is content focused on in current math lessons al GLC's primary level?

Objectives

In order to answer the research questions, this study has four objectives which are stated as follows:

1. Identify the current methodology implemented to develop math lessons at GLC.
2. Determine how general language is focused on in current math lessons at GLC.

3. Determine how subject academic language is focused on in current math lessons in at GLC.
4. Establish how content is focused on in current math lessons at GLC.

Setting of the Study

The current research project takes place at Aspaen Gimnasio los Corales (GLC), a female bilingual school located in Puerto Colombia, Atlántico. The school has an area of 46,000 meters and a population of about 270 students including preschool. The target population for this study is primary, which currently has a population of 89 students from first to sixth grade with ages from seven to twelve years old, and a staff of 15 female teachers of which three teach mathematics. This case study will be focused on these three teachers and the classes they teach (which are students from first to fifth grade with ages from seven to eleven years old) to see how they are planning and implementing CLIL in their lessons.

The school opened for the first time in 1986 when a group of parents decided to actively participate in their children's education; thus, knowing the philosophy of Aspaen schools in Colombia and the prestigious education they offer, they decided to open their own school. GLC is based on Catholic principles and is concerned with the importance of each student and teacher as a person who deserves respect. The main approach of the school is based on a personal, well-rounded and differentiated education (girls taught by women). They strive to create learning to foster students' biological potential and meet their behavioral needs.

In addition, the school has its own pedagogical approach based on developing interdisciplinary projects ("Prime" for preschool and "Novus" for primary and high school). These approaches look for the integration of areas of knowledge and the development of cooperative learning, and aims at fostering students' creativity and teachers' team-work. CLIL fits in perfectly with Prime and Novus because both aim for the development of tasks that involve learning in a constructivist way. For Aspaen's approach as well as for CLIL, learning must be centered on the students, allowing the students to be active in their learning process. The teacher's role is to guide them in order to achieve their learning objectives.

The school became bilingual in 2002 when it implemented an English immersion approach which began in preschool; so the children started having subjects such as math and science in English and an intensification of English lessons. They actually started the literacy process (learning to read and write in English) that year. Initially the pilot group was kindergarten and more subjects were taught in English as they advanced year after year. The other groups continued intensifying English and the learning of some vocabulary related to other subjects, but they mainly continued learning math and science in Spanish. As the years passed and the pilot group advanced, subjects such as mathematics, science, and language arts started being taught in English at primary level. Two years after, social studies also started to be taught in English in primary school when the pilot group was in third grade. While preschool and primary were almost completely immersed, middle school started to study only English and math up to sixth grade.

In 2006, Aspaen designed a national bilingual curriculum named ALAC, which had as its purpose the unification of content and learning objectives in math, science, and English in all the schools in Colombia. Due to the imminent need to prepare international learners, able to succeed at any project; students with a core set of global knowledge and a global perspective of the world, committed and engaged with their own learning process, in 2012 GLC and Aspaen's schools in Colombia started to work for the accreditation as a Cambridge Associate School and in 2013, GLC received the official certification from the University of Cambridge. Currently, GLC and most of Aspaen's schools belong to a large community of 9,000 schools all over the world and use an international curriculum that aims at fulfilling international standards that help students become global learners.

In addition, teachers have received training not only in CLIL but also in professional development in order to improve in the subjects they teach. Every year, teachers participate in regional trainings offered by the British Council in order to learn about pedagogical implications in teaching specific CIE subjects. They also continue their professional development through trainings, lectures, and workshops which take place during the year. Annually, the school's principal and the CIE coordinator participate in the Colombian CIE schools conferences. This is a space to share experiences, participate in lectures, conferences and forums, and learn about the latest advances in the program.

Currently, GLC students are learning math, science, social studies, and language arts in English from pre-kinder until fifth grade. In sixth, seventh and eighth grade, students are learning math, science, physics, global perspectives, and language arts in English; and in high school, they are taking global perspectives, language arts and one hour for Cambridge exam preparation in English.

Outline of the Thesis

This chapter has given a basic overview of the research problem, the context in which the research will take place, the research questions to be answered and the objectives aimed to be achieved with this study. The second chapter, titled the Theoretical Framework, will provide the theory required to support the study; the definition of CLIL, importance of language for teaching the content, the stages in a CLIL lesson, the theories supporting CLIL, CLIL in Colombia, CLIL in the world, the essence of mathematics, the importance of mathematics in education, traditional instruction of mathematics, new strategies to teach mathematics effectively, the importance of learning mathematics in English and how a CLIL classroom becomes an effective opportunity to improve the learning of mathematics, and the qualities of a good math teacher. The third chapter, titled the Research Method and Design, will describe the paradigm, method, type of study, and data collection techniques and procedures necessary to collect and triangulate reliable evidence in order to find out answers for the research questions. The last chapter, titled Results and Analysis, will describe the results obtained from the data collection techniques and procedures (observation, interview and analysis of documents) and will provide a detailed analysis of those results, how they match with the theoretical framework, and the conclusions of the study.

II Theoretical Framework

As the main purpose of this study aims at discovering how effective CLIL can be in order to fulfill cognitive and language needs regarding learning mathematics at GLC, it is essential to know what CLIL is and understand the main features that frame this approach and to understand important aspects related to mathematics. Therefore, this chapter is divided into these two main areas. The first major section, related to CLIL, begins with an in depth-definition of CLIL and details major characteristics of the approach. Then it continues with the importance of language for teaching content, stages in a CLIL lesson, and the theories that underpin the CLIL approach. Finally, it presents some studies that have reviewed the use of CLIL in Colombia and in other parts of the world.

The mathematics section highlights important aspects related to understanding the essence of mathematics and the importance of mathematics in education. Next, it describes traditional and new ways to teach mathematics, how useful teaching mathematics in English is and how CLIL positively supports this teaching; and finally, it ends with the qualities of a good primary mathematics teacher. All of the theories and literature on the topic found in this chapter are important in order to understand the concepts underpinning this research study.

CLIL

Definition of CLIL.

According to Dalton-Puffer (2007) CLIL "refers to educational settings where a language other than the student's mother tongue is used as medium of instruction" (p. 1). Meanwhile, Wolff (2007) defines CLIL as "an educational approach (…) based on the assumption that foreign languages are best learnt by focusing in the classroom not so much on language but on the content which is transmitted through language" (p.15). Referring to CLIL, Navés (2010) explains that CLIL offers a means by which learners can continue their academic or cognitive development while they are also acquiring academic language proficiency" (p. 156). According to these statements, CLIL attempts to help teachers and learners develop strategies which ensure content learning as well as language support required to improve fluency, especially in a foreign language.

Using CLIL as a learning strategy may bring a variety of benefits that help learners not only to improve language proficiency but also to emphasize on content, cognitive needs, and differentiation according to learning styles. "CLIL not only promotes linguistic competence, it also serves to stimulate cognitive flexibility." (Coyle et al., 2010, p.10) CLIL goes beyond simply teaching language structures, vocabulary, and reading comprehension, often in a decontextualized way, as other traditional methods such as audio-lingual, grammar-translation, input-output, or other communicative approaches do.

Current globalization and social needs demand a change in learning because just knowing English or any other language is not enough to prepare learners to compete in international scenarios. Language learning has to focus on purposes different from basic conversational language. Global learners require content knowledge and specific-subject vocabulary to allow them fulfill the current educational demands. Frigols, Marsh, and Naysmith (2007) argue that "to move closer to a knowledge-based society, Europe needs an innovation strategy within which to foster investment. Future-oriented designs and new approaches to learning are essential ingredients of such a strategy" (p. 34). As a response to this issue, the European Commission has accepted CLIL as an educational alternative to accomplish their objective.

CLIL goes beyond a simple language lesson plan since it involves other aspects relevant for lifelong learning. CLIL integrates four components necessary for meaningful learning: "content (subject matter), communication (language learning and using), cognition (learning and thinking processes) and culture (developing intercultural understanding and global citizenship)" (Coyle et al., 2010, p. 41). This combination, known as the 4Cs, determines learning effectiveness since students have the possibility to develop skills vital for a clear understanding of the subject and foster more engagement towards the target subject as they learn competences necessary for them to be successful in the modern global world.

Wolff (2007) defines content as a "form of knowledge acquisition" (p.18). Usually, content is taught from a conceptual understanding of the subjects, mostly focused on learning concepts, theories, formulae, and some content-specific vocabulary. According to CLIL, content has to fulfill more than the requirements of a static curriculum only framed on conceptualization. Coyle et al. (2010) state that according to CLIL "content does not have to be part of a discrete curriculum discipline such as math or history, it can be drawn from alternative approaches to a curriculum involving cross curricular and integrated studies" (p.53). Thus, content has to aim at the development of a variety of skills that enrich knowledge and improve learner's subject understanding, rather than only specific subject knowledge frequently taught in isolation.

Regarding another of the 4Cs, communication, or language use, CLIL becomes a vehicle to provide different possibilities of interactions in a variety of contexts that help learners become more fluent and confident when sharing findings, ways of approaching an inquiry, or reporting results after developing a project or any other task. Thus, "language is a conduit for communication and for learning which can be described as learning to use language and using language to learn" (Coyle et al., 2010, p.54). It is advantageous because learners do not have to follow a given model to express their ideas, thoughts or opinions, nor just follow the last grammar rule they recently learned; they have the opportunity to express themselves in a spontaneous way and use language naturally. At this point, CLIL allows learners to develop what authors such as Habermas (1970) and Hymes (1971) described as "communicative competence" through the development of communicative skills in a real environment. In a math lesson, for instance, the students have the possibility to talk, read, write, and listen in the foreign language at the same time they learn mathematics. The teacher can actually use different types of sources such as videos, songs, and other materials in order to provide different opportunities to interact, thereby, enhancing content and providing opportunities to develop language in the classroom. Savignon (1997) defines competence as the ability to express, interpret, and negotiate meaning in terms of psycholinguistic and sociocultural perspectives in the context of second language acquisition. Therefore, the interaction between the students is crucial for understanding, and a CLIL lesson fosters opportunities for such types of interactions.

Another advantage of CLIL, and another part of the 4Cs, is the importance of culture in the process. Learners understand better when they are familiar with the cultural context where they are learning, so personalization makes learning more understandable, meaningful, and useful in everyday situations. However, it is not enough just to frame learning in their own culture, but they also have to be familiarized with cultures from all over the world in order to understand different contexts in which learning also takes place. From the perspective of CLIL, culture enhances intercultural exchanges, respect for others, and tolerance. As mentioned by Coyle et al. (2010) "studying through a different language is fundamental to fostering international understanding" (p.54).

Cognition is also an important CLIL foundation. It is based on constructivism and current active learning approaches and points to precisely develop thinking skills that help learners gain confidence in the knowledge of specific subjects. It is vital to give learners the opportunity to build up their own learning, and this can be achieved if they have real awareness of learning and engagement to learn. For a CLIL lesson, assessment goes beyond a test that measures how much content has been learned, but how much engagement in learning the students learning have and how meaningful the learning can be. Coyle et al. (2010) summarize cognition as the "engagement in higher-order thinking and understanding, problem solving, and accepting challenges and reflecting on them" (p. 54). In order to certainly provide this type of learning experiences, CLIL offers a variety of possibilities to engage learners to reflect on learning, pointing to the development of lower as well as higher order thinking skills. The design of challenging tasks, according to learners' characteristics (such as age, abilities or learning styles), helps develop metacognition, authentic knowledge, and critical thinking skills.

Importance of language for teaching the content.

Implementing CLIL in the classroom helps learners become more confident and fluent about the use of language. With regards to this, Dalton-Puffer (2007) states that “CLIL rationales regularly draw on the position that CLIL classrooms represent an environment where language can be acquired under naturalistic conditions rather than learnt through explicit instruction. A main argument in this respect is that such classrooms offer opportunities for authentic communication” (p. 201).

In addition, CLIL points to the development of academic language, which Cummins (2012) conceptualizes as CALP (Cognitive Academic Language Proficiency). CLIL lessons must be carefully planned in order to train learners in a wide range of CALP necessary to improve understanding of content and understanding of the academic language that frames the purpose of each lesson. Thus, the students can learn terminology and academic expressions inherent to a specific filed of knowledge, providing better tools to develop cognition, since another advantage of CALP is that the student not only learns subject specific vocabulary, but also handles academic language functions necessary to develop lower and higher order thinking skills. With regards to this, Dalton-Puffer (2007, p. 202) presents an “amalgamation” from different taxonomies (O’Malley/Chamot, 1987; Snow/Met/Genesee, 1989; Kidd, 1996; Krechel, 1999; and Suhor, 1984) which compiles the main functions of academic language.

Assessing	Explaining
Analyzing	Giving information
Classifying	Hypothesizing
Comparing	Informing

Defining	Narrating
Describing	Persuading
Drawing conclusions	Predicting
Evaluating	Requesting information

In order to achieve communicative competence in terms of both general and academic language, a CLIL lesson aims at focusing language objectives from three perspectives: "language of learning," "language for learning," and "language through learning" also known as "the language triptych." This language triptych is defined as the "need to integrate cognitively demanding content with language learning and using" (Coyle et al., 2010, p. 36). When planning the language objectives of a lesson, the CLIL teacher has to analyze those abilities required to use language as a vehicle to understand the content, the specific subject terminology, and the skills required to develop subject understanding ("language of learning"). Parallel to the "language of learning," it is vital to think about "language for learning." This can be defined as those cross-curricular language tools that the learner requires in order to actively and effectively participate in typical class activities such as plenaries, discussions, teamwork, planning projects, or simply asking questions in second language. In addition, there are other individual language needs that the learners have to develop in terms of personal proficiency ("language through learning"). Opposite to "language of learning" and "language for learning," "language through learning" cannot be foreseen. Learners needs arise during the process of communicating, at the moment in which the interaction takes places, and it depends on each learner's fluency and proficiency. Therefore, the teacher cannot have a specific objective for each student. However, the CLIL teacher can foster "language through learning" by continuously supporting language during the teaching-learning process, avoiding recurrent grammar lessons every time a learner needs language support to communicate skills. (Coyle et al., 2010, p. 36-38)

Stages in a CLIL lesson.

In order to understand the structure of a CLIL lesson, it is important to have a model which can guide the planning and help the teacher to be aware of the main aspects in a CLIL lesson. Coyle et al. (2010) suggest a detailed lesson plan with the main criteria for a CLIL lesson based on what they call the "novelty continuum." From that suggested plan, here there is an adapted description of the stages of a CLIL class and the aims of each stage.

- Warm up: points at activating the students' prior knowledge in order to make associations of previous knowledge with new learning.
- Main introductory stage: aims at providing a variety of activities in order to help the students familiarize with the new content.
- Main learning stage: promotes application of the new knowledge. This stage provides opportunities for cooperative learning.
- Extension activities: promotes the application of learning by fostering reflection on the content. In this stage the students can work in projects related to their context.
- Consolidation of learning and subject vocabulary: wrap-up activity ideal to review subject vocabulary and main content and language learning.
- Self-assessment: foster metacognition and awareness of learning.

The CLIL teacher has to ensure the planning of language of learning, language for learning and attempt to foresee possible language through learning needs necessary for each stage of the lesson. Otherwise, the lesson could possibly be focused only on content and might neglect the language support necessary for learning.

Theories supporting CLIL.

Due to the increasing need to improve the quality of education all over the world and the global demand for trading, social issues, technology, and international relationships, nations have focused interest in promoting bilingual education in order to prepare their citizens to face the challenges of the current century. Jäppinen (2005) explains that this is a special concern in Europe since the changing impact of globalization and the eminent social changes that have taken place in terms of economy, politics, and the arising of new cultures require making decisions in terms of the quality of education required to fulfil current world's demands. He contends that "this change includes the question of increasing the efficiency and scope of language learning. Teaching a content through a foreign language can be regarded as an approach to rise to this challenge" (p.148). CLIL, as other approaches and methods, has aroused as a response of these educational needs, which are not exclusive in Europe, but they have become a common issue in almost all the continents, including South America; therefore many educational institutions have adopted CLIL as a way to find solutions to these concerns.

CLIL has a solid pedagogical foundation that supports it as a reliable learning approach. According to Xanthou (2011), CLIL has been influenced by modern education theories such as Krashen's implicit acquisition of language in 1982, Vygotsky's social constructivism in 1978, Piaget's cognitive constructivism in 1963, and Cummins's language development in 1981. CLIL allows implicit language acquisition since learners develop communicative skills and competences in a natural way. CLIL learners use language to convey meaning, plan a project, draw conclusions, discuss points of view, as well as many other purposes which enhance the possibilities to learn language without focusing on specific grammar rules or language structures; therefore, learners acquire the second or foreign language in a way that is very similar to that used to learn their native tongue. "Krashen argued that acquisition takes place when the language skills are developed through use in a way similar to how native speakers learn grammatical rules" (Xanthou, 2011, p. 117). Native speakers learn the grammar by using the language. A child learning the language at home learns the grammar, vocabulary, and the semiotics of language in a natural way. The new speaker listens, observes, and adopts a language culture by associating and applying the new learning.

From social constructivism, CLIL has a strong support in Vygotsky's zone of proximal development (ZPD). Zaretskii (2010) explains that Vygotsky argued "the need for developmental diagnostics to consider not only what children can do independently, but what they can do with the help of an adult" (p. 70). Zaretskii also explains that Vygotsky called the "zone of proximal development" to the range of all of the actions or activities that children either do with the support of adults "or in collaboration with them," "distinguishing it from the zone of actual development, within which children manage all actions independently" (p.70). In CLIL, this theory strongly supports Bruner's (1978) scaffolding, which is a pedagogical strategy in which teachers break down complex learning processes (or authentic material) into step by step tasks which enable learners achieve the learning objectives in a more understandable way; therefore, the teacher is a facilitator who helps the student to effectively address learning.

As one of the principles of CLIL has to do with the development of cognition, cognitive constructivist theory plays an important role in a CLIL classroom. A CLIL lesson always takes as the starting point the learner's prior knowledge; thus, the student can create connections between previous learning and the new content. These types of associations facilitate new learning and foster students' engagement to construct new knowledge. von Glasersfeld (1996) explains that, according to Piaget, "the function of intelligence was not as traditional epistemology held, to provide cognitive organisms with 'true' representations of an objective environment. Rather he began to see cognition as generator of intelligence tools that enable organisms to construct a relative *fit* with the world as they experience it" (p. 22).

As language is a vital principle of CLIL, it is important to understand the theory that supports it. Xanthou (2011) explains that in CLIL, language is strongly founded on Cummins language development theory which states that "humans develop two different kinds of language proficiency: social and academic language. Social language is informal and cognitively less demanding as a result of being contextualised. Academic language is more formal and cognitively demanding" (p. 117). As mentioned before, the academic language that Cummins has termed as CALPS is something that CLIL explicitly aims to develop.

It is a fact that CLIL aims at developing language skills which are used according to specific functions and purposes; however, it is important to note that social language

(BICS, according to Cummins) is also developed in CLIL classrooms. As learners interact for different social purposes, a CLIL lesson also provides spaces for that social interaction. Learners have the possibility to exchange information, make decisions regarding planning a project or solving a problem, ask questions for different purposes, and even they may play games as part of the learning process. All of these academic or social interactions are based on fulfilling learning needs and objectives.

Besides the aforementioned theoretical groundings, CLIL is also related to educational practices such as immersion and content-based language teaching, or English as an Additional Language (EAL), but it has fundamental characteristics that make it different from these practices. According to Pérez-Cañado (2012) "CLIL is considered to be a descendent of French immersion programs and North American bilingual teaching models" (p. 316). The French Immersion programs started in 1965 with a project in Canada in order to use "French as a medium of instruction of monolingual English-speaking children" (Dueñas, 2004, p. 81). It was a total success and continued expanding to the United States and then to all over the world. Leung (2005) reports that in 2004, official statistics from the state of Arizona showed better performance of students in immersion programs than those in bilingual programs. The Arizona Department of Education (2004) writes:

> Students in structured English immersion programs outperformed students in bilingual programs in that they were anywhere from one to four months ahead between second and fourth grade, as much a six months ahead in fifth grade, and over a year ahead from sixth grade on. This means that for students in sixth grade and above, students in

> structured English immersion programs were over a year ahead of students in bilingual programs. (p. 240)

However, Pérez-Cañado (2011) presents some advantages and disadvantages of immersion programs which are good to consider. Among the advantages, it is important to note that students from immersion programs "acquire impressive amounts of the second language" and "attain nativelike receptive skills" (p. 317) and become more proficient than non-immersion learners. They also develop subject knowledge proficiency at the same level as monolingual learners. Moreover, learning a second language does not affect first language skills. Finally, immersion students develop good cognitive skills. However, according to this study, immersion students usually do not develop sufficient proficiency in oral or written skills.

Another modality for language and content teaching that has similar foundations as CLIL is Content based instruction (CBI; also referred to as Content based language instruction (CBLI)), which has been defined as "an integrated approach to language instruction drawing topics, texts, and tasks from content or subject-matter classes, but focusing on the cognitive, academic language required to participate effectively in content instruction" (Crandall & Tucker, 1990, p. 83). Other authors define CBI as "the teaching of content or information in the language being learned with little or no direct or explicit effort to teach the language itself separately from the content being taught" (Richards & Rodgers, 2001, p. 204).

As CLIL, CBI aims to develop "learning a language through academic content, engaging in activities, developing proficiency in academic discourse, fostering the development of effective learning strategies" (Crandall, 1999, p. 604). Stroller (2004) states that "in successful CBI, learners master both language and content through a reciprocal process as they understand and convey varied concepts through their second language" (p. 262). CBI may be advantageous for those learners who are acquiring a second language but are also specializing in a specific content.

A common purpose for CLIL and CBI is language learning. CBI does not focus on language knowledge as learning parts in isolation, but as a whole which requires learning communicative skills necessary to interact in an effective way with others. Since language is purposeful, CBI and CLIL develop language skills which help foreign learners improve language proficiency and content learning framed on a specific context.

In fact, CBI and CLIL share most of their principles. For instance, both approaches point to develop language as well as content. Brinton, Snow, and Wesche (1989) define CBI as "the integration of a particular content with language teaching aims" (p. 2). At this point, language is focused as a tool to enhance content learning. It is conceived as learning beyond decontextualized grammatical rules totally meaningless for learners. According to Dueñas (2004), "content-based approaches suggest that optimal conditions for learning a second/foreign language occur when both the target language and some meaningful content are integrated in the classroom" (p. 74).

Another characteristic of CBI and CLIL is flexibility. Both approaches permit the design and development of a variety of activities which help students access to language and content according to their needs. Strategies such as scaffolding are particularly useful to facilitate learning according students' learning styles and needs. Dueñas (2004) explains this: “CBI cannot be conceptualized as a fixed, immovable method; quite contrarily, it is commonly perceived as a flexible operational framework, for language instruction, with heterogeneity of prototype models and application options available for different contexts and pedagogical needs” (p. 75). In CBI the topics, content, materials, and learning activities should correspond to the cognitive and affective needs of the students and should be appropriate to the level of proficiency of the class.

As CLIL and CBI have very similar bases and conceptualizations, for the purpose of this study, some literature from CBI will be used to support arguments and aspects of this study.

Another strategy which has some similarity with CLIL is English as an Additional Language (EAL). This form of teaching content has arisen due to immigration to countries where English is the first language, so learners have to learn content from different subjects in a language they are just learning. In order to facilitate learning, schools provide some training in English; thus, the students can overcome difficulties in learning in an additional language. Barwell (2005a) explains that “while learners of EAL may appear to have mastered English within less than two years, they can take several more years to achieve native-speaker proficiency in the use of mathematical English” (p. 330). In another article, Barwell (2005b) highlights that “learners of EAL join mainstream classes, with language support often provided in the context of subject teaching” (p.206). Quoting Duff, Barwell explains “that away from mainstream classes, learners of EAL have little exposure to native-speaker language use, whilst in mainstream classes, such learners may be marginalized” (p. 206).

Compared with CLIL, EAL is more focused on subject-specific content rather than language learning. It might be more difficult for learners to access knowledge with the issue of language misunderstanding. Although English training might help, they would probably have difficulties in developing a high level of English language proficiency and good communicative skills.

After reviewing these approaches and methods which have influenced CLIL, it is important to clarify that all of them are worthy and valid methods for bilingualism; however, it is important to choose the most effective for the education purposes to be achieved. What is clear, as Genesee (as cited by Perez-Cañado, 2011) has argued, is that "the overriding conclusion which can be reached from the precursors of CLIL education is that L2 instruction which is integrated with content matter has proved to be more effective than L2 instruction in isolation" (p. 318).

CLIL in Colombia.

Since 2002, the Colombian government has been showing special concern for bilingual education. The Colombian Ministry of **N**ational Education (MEN) started the Colombia Bilingual Project with the objective of improving English proficiency according to the Common European Framework for Languages (CEF). McDougald (2009) explains that "through the M.E.N.'s Colombia Bilingual Project, English is now a part of the State Curriculum, in which the Common European Framework for Languages (CEF) is used as a source of reference. The new state language curriculum contains a comprehensive description of language proficiency along with associated assessment standards, so that there is transparency and consistency in English language teaching throughout Colombia" (p.45). In this program, the MEN established linguistic goals for the different levels of the Colombian educational system. Students finishing primary should have at least an A2 level of English, while learners finishing high school should have a minimum of a B1 level of English (Corrales, Ferrer, & Rey, 2015). However, it seems that results are not as expected. In a recent article, McDougal (2015) analyzes the results of the Prueba Saber Pro and found that "only a 6.5% of university students achieved a B+ (a higher level than B1) level and 2% in of high school graduates (Prueba Saber 11) in B1" (p. 32).

In contrast to these statistics, it is undeniable that more Colombian students are interested in studying at universities in other countries and they need to know at least one language different from their native tongue. In line with this issue, Lethaby (2015) states that "it is becoming increasingly clear that there are more opportunities available to people who have knowledge of the English language, both for study and in terms of getting a job. Any student who wants to study a postgraduate degree is at an advantage if s/he is an efficient reader in English and obviously study opportunities in other countries are often only open to those who already have a knowledge of English" (p.4).

However, the current international academic demands require not only preparation in language but also in specific subject contents. Regarding this statement, McDougal (2015) argues that "in a globalized society, the ability to use a second language is not only an advantage but an urgent necessity. However knowing about English is not enough for the 21st Century citizens, where additional skills such as learning, literacies and life-long skills are also needed" (p. 33).

Concerned about these issues, more bilingual schools and universities in Colombia are currently working to achieve excellence in their processes and are preparing their students to compete in a globalized society. Many are adopting CLIL as a strategy to cover both content and language needs. According to Rodriguez (2011), CLIL is being implemented in Colombia in different ways. Some institutions for instance, have incorporated “at least a core area – content learning” which has commonly been science. Teaching science in English facilitates differentiation and fosters more students’ participation in “hands-on activities and experiments to learn key concepts” which enrich learning and enhance student centered lessons. (p.83)

Some research projects, especially case studies are being performed in Colombia in order to use CLIL as an alternative to fulfill current academic needs. Camacho (2015) shares her experience on implementing CLIL for teaching social studies content in fifth grade at Liceo Católico Campestre. This study found that “using a CLIL approach in the social studies class can foster learners’ cognitive skills in terms of target language and content language simultaneously” (p. 45).

Other researchers have also studied cases of CLIL in the classroom as an effective language and content learning strategy. Otálora (2009), for instance studied multiple applications of an action research process to identify effective instructional strategies at university level. She wrote: “English content-based teaching and learning has shown that considering learning strategies geared towards content delivery with the student being the center of the learning and teaching process simultaneously enhances the delivery of content and the acquisition of skills in a foreign language”. (p.48)

In the same line, Elizabeth Vides (2014) carried out an interesting analysis regarding an attempt to implement CLIL at IED Sofía Camargo de Lleras (a public school in Barranquilla, Colombia). As a result of her research, Vides concludes that:

> This content and language integrated learning program seems to be appropriate to address students' target needs and institutional demands in terms of speaking skills development and personal development fostering recognized as identified needs from the needs analysis process or context evaluation stage results. Students were able to develop language skills at the same time that they reviewed and raised self-awareness through personal development content and activities about topics related to personality, communication, careers perspective and health. (p. 252)

González and Arias (2009) performed a research project titled "Enhancing Oral Interaction in English as a Foreign Language through Task-Based Learning Activities." Although it is not exactly a project about CLIL, it is interesting to mention it since it has bases from TBI (Task-Based Instruction) and it is closely related to CBI and CLIL. In conclusion, Hernández and Arias (2009) state that the results of the study:

> offer strong support for implementation of strategies including such activities in order to enhance oral interaction in language classrooms. Moreover, such activities which involve the comprehension of, manipulation of, rehearsal of, and exposure to combinations of the "known" and the "new" are particularly helpful in terms of encouraging meaningful and authentic oral communication. (p.8)

CLIL in the world.

As a pedagogical strategy, CLIL has had the greatest incidence in Europe where it has been adopted as a pedagogical concept more than thirty years ago (Frigols, Marsh & Naysmith, 2007). “It has become firmly established as an innovative and rapidly expanded form of language-enhanced education (see Council Resolution 31 March 1995; CLIL/EMILE – The European Dimension: Actions, Trends and Foresight Potential, European Commission 2002, Eurydice 2006)” (Frigols, Marsh & Naysmith, 2007, p.34).

In most of the European Union countries, CLIL has had a great impact in their education system. This can be seen in Finland where this country “is one of the pioneers in the European CLIL, especially in the public mainstream education where, in 1996, 8% of the Finnish primary and 15% of the secondary mainstream schools were assumed to use a foreign language as a medium of instruction (Nikula & Marsh, 1996). Since then, the number of CLIL programmes has increased” (Jäppinen, 2005, p.149). Jäppinen (2005), citing Nikula (1997) also refers to this phenomenon when quoting that “what is true of many European countries also applies to Finland: the popularity of CLIL started to increase in the early nineties when the school laws for the first time made it possible to offer instruction in languages other than the two official languages of the country, Finnish and Swedish (Nikula and Marsh, 1997)” (p. 183).

By the early 1990’s, the Ministry of Education in Austria started the project called “Push for Foreign Languages,” which aimed at using foreign languages as a “vehicle for the teaching of subject specific content…The fact of the matter is, however, that every Austrian secondary teacher can include CLIL in their classes” (Gierlinger, 2007, p.79).

Consequently, CLIL has also been recognized by the government of Austria as an alternative to achieve their goals in terms of their educational project.

CLIL has also had a positive impact in Germany because it is considered as an effective approach to achieve plurilingual education objectives, which point to instruction in another language, different from the first or official language, in order to develop "cognitive academic purposes, embedded into cognitively demanding tasks and conceptual frameworks, leading to the development of subject-specific discourse competence in L2" (Vollmer, 2010, p.31). Vollmer (2010) also states that one of the reasons of the success and popularity of CLIL in Europe has to do with the improvement of proficiency in second language and the simultaneous development of skills in "subject-specific discourse;" therefore, CLIL has become a suitable approach which supports internal and external plurilingualism and fulfils the learners' needs.

CLIL is not exclusive for school education, but also for vocational education and training. Xanthou (2011) explains that The European Commission urges in the White Paper that the students in secondary schools should learn "certain subjects in the first second language they have learned" (p. 116) in order to use the second language as a mean of instruction. In addition, they also suggest the implementation of CLIL in the field of Vocational Education and Training (also known as VET). Frigols, Marsh, and Naysmith (2007) explain that teachers and VET, in general, need to be trained for the challenges of the new educational realities that are currently taking place in Europe; consequently, their primary focus aims at implementing CLIL in the VET sector.

A main issue in Europe is the fact that there are not unified regulations for CLIL in the European Union; therefore, each country can implement it according to internal policies. Actually, in Germany and other countries, CLIL is called “Bilingual education” (Vollmer, 2010). In Austria for instance, it use has become almost optional as Gierlinger (2007) explains: “CLIL in Upper Austria and in most of the rest of Austria is a voluntary enterprise driven mostly by individual teacher’s motivation” (p. 80). Gierlinger (2007) also argues that the main reasons for this situation are related to little support on teacher training, lack of language assistants to support teachers, no external incentive for CLIL teachers, little material, extra administrative effort regarding briefings, information materials and conferences; and lack of support from pedagogical authorities.

However, in Estonia, where CLIL is also a voluntary program, the experience has been really successful. “One particularly successful Estonian language-learning programme is a voluntary CLIL programme. It was launched nationally in September 2000 in four pilot schools beginning in grade one. Inspired by the success of the early CLIL programme, a late CLIL programme beginning in grade six was launched in 2003” (Mahisto, 2007, p. 61).

According to the literature on the topic, the experience of CLIL has been successful in most of the countries where it has been implemented. Those mentioned in this section illustrate the experience in Europe; however, it continues to expand its popularity worldwide.

Mathematics

This section of the chapter turns its attention to the area of mathematics, mathematics teaching, and the intersection between mathematics and CLIL.

The essence of mathematics.

Understanding the essence of mathematics has been a controversial issue throughout history. Frequently, learning mathematics has been reduced to solving problems related to algebra, arithmetic, calculating measures, handling data, geometry, and trigonometry in an exact way with a single answer that the teacher already knows beforehand. However, it is necessary to have clarity in two significant aspects that frame the basis of this subject: the definition of mathematics and the language of mathematics.

In order to understand mathematics, it is important to define what mathematics is. In 1957, Pólya defined mathematics from two perspectives: from a "Euclidean way," mathematics "appears as a systematic, deductive science;" but on the other hand, as part of the process of "making," mathematics "appears as an experimental, inductive science" (p. vii). This means that mathematics is both systematic and experimental; but also deductive and inductive. At this point, Frechet (1955) defines mathematics as a not "completely logic theory." He mentions that "despite of the fact that most of the mathematical works consist in doing logical transformations from propositions admitted as truthful" there is a percentage of "intuition" which "guides the work in a specific direction" (p. 21-22). According to these definitions, and in spite of the fact that mathematics is exact, precise, and systematical, it cannot be limited to a single way of solving problems. The learner can also experiment different alternatives to explore and find solutions from different perspectives. In fact, the mathematician may use her or her own logic and intuition to find the solution of a mathematical issue.

Besides the complexity of the nature of mathematics, the language of mathematics is another crucial aspect to consider. For many students, learning mathematics turns into a difficult task. They not only have to deal with formulae, concepts, and logic but also with a specific language and symbols which require being decoded. All these codes are part of a message that contains meaning and must be accurately communicated. Restivo, Van Bendegem, and Fischer (as cited in Barton 2008) argue that "pure mathematical concepts appear objective when they are communicated, hence mathematics is a social world of people communicating about their ideas—agreeing, disagreeing, arguing" (p. 125). Therefore learning mathematics must go beyond the "world of triangles, symbols, rules of argument" (p. 125). Mathematics is actually "a world of networks of people talking about ideas" (p. 125). Thus the same way as grammar rules, syntax, semiotics, morphology, context clues, and other language aspects must be learned and understood to communicate effectively, it is necessary to learn to understand the language of mathematics in a social context.

Supporting the same idea, Rotman (2006) explains that "any mathematical text is written in a mixture of words, phrases, and locutions drawn from some recognizable natural language together with mathematical marks, signs, symbols, diagrams, and figures that (we suppose) are being used in some systematic and previously agreed upon way" (p. 102). He also adds that:

> …we will also notice that this mixture of natural and artificial signs is conventionally punctuated and divided up into what appear to be complete grammatical sentences; that is, syntactically self-contained units in which noun phrases are systematically related to

> verbs (‘count’,‘consider’,‘can be evaluated’,‘prove’,and so on) in what one takes to be the accepted sense of connecting an activity to an object.” (p. 102)

As consequence, understanding mathematics requires a serious learning of the semiotics of each sign, the meaning of each word in the mathematical context, the decoding of the message in a precise context, the selection of information necessary to solve a question or problem, and the accurate use of mathematical language to appropriately support a thesis, demonstrate a hypothesis, or communicate findings.

Campbell, Adams, and Davis (2007) explain that “a problem solver begins with an observation of the complexity of the cognitive demands of interpreting and understanding the problem and the testing situation as the problem is read for the first time” (p. 9). Thus, it is a challenge for the learner of mathematics to try to decode the complexity of the problem at once. Solving problems is a very challenging task that requires different steps and processes to successfully carry it out. It is not enough to know the content or know how to solve operations in isolation, but it is necessary to understand context clues such as cultural implications (especially when teaching in ESL when a topic such as money will be different from country to country and many textbooks show this topic either in terms of American or British money), language understanding, in order to understand the situation described in the problem, and the semiotics of mathematics.

All these aspects are relevant to help the learner make decisions on choosing the precise strategy and use it accurately in order to find the solution of the problem. To summarize Adams et al. (2007, p. 9-12), in the first stage of the problem, the learner has to understand what the problem to be solved is; understand particular pieces of language that will help identify implicit or explicit variables necessary to mathematically understand what has to be done to solve the problem. In the second stage, the mathematician needs to transfer language to mathematical language and rewrite the problems in numbers and symbols. Finally, the problem solver has to test the hypothesis and verify if the procedure chosen is accurate for the particular situation shown in the problem.

Importance of mathematics in education.

Mathematics is a common subject for all educational systems in the world, and its principles and contents do not change from country to country. However, when evaluated with standardized tests such as PISA (Program of International Student Achievement) or the Trends in International Mathematics and Science Study (TIMSS), the rankings seems to show that in many countries the students are not developing skills, content, and competences in the same way. Countries such as China, Japan, Korea, and Singapore usually obtain the best rankings in mathematics; they have developed successful strategies that have helped their students develop skills and higher performance than the rest of the world, positioning them with the highest scores for about thirty years (Lee, 2014, p. 364). Mullis, Martin, Foy, and Arora (as cited in Lee, 2014) explain that “their scores notably rose in the early 1980s and continue to be substantially higher than those in the rest of the world in recent international assessments. For instance, Korea, Singapore, Chinese Taipei, Hong Kong, and Japan ranked in the top five positions on the fourth- and eighth grade mathematics tests in the most recent TIMSS” (p. 364).

In addition, the achievement gap between the fifth-ranked Japan and the sixth-ranked country was substantial: 23 points for the fourth-graders in Northern Ireland and 31 points for the eighth-graders in the Russian Federation. Lee (2014) also mentioned that "the larger score gap in the upper grade was also a point of concern for other nations" (p. 364).

Even more worrying is the case of Colombia which remains 61 in the PISA ranking. As mentioned in the introduction, concerns about improving the quality of education in Colombia are not new; however, it seems that actions that have been taken have not been enough to improve performance. Regarding this issue, Agudelo-Valderrama (2008) argues that:

> Since 1994 when the General Law of Education was issued, teachers have been urged to engage in a continuous process of curriculum construction, as education is to be improved by attending to the needs of the specific communities which schools serve. The continuous process of constructing the curriculum is to be anchored in the fundamental aim of educating critical citizens (Articles 5 and 21). The mathematics curriculum guidelines (Ministerio de Educación Nacional 1998) emphasise a shift in teaching methods from the traditional transmission approach to one in which problem-solving and learning with meaning are at the centre of classroom activity. (p. 38)

The PROMECA project, which in Spanish stands for "Promoting teaching for understanding in elementary algebra," is a study carried out by Agudelo-Valderrama and reported in 2008. The results she found demonstrate that "many mathematics teachers have negative attitudes to changing their teaching approaches despite their awareness of pupils' difficulties and lack of motivation for the learning of school algebra" (p.38). According to this study, many teachers still think that mathematics should be taught through mechanic decontextualized exercises.

O'Brien, Rowan and Bourne (as cited in Carrasquillo & Rodriguez, 2001) state that "mathematics understanding and problem solving help students not just to learn mathematical concepts but provide the processes to improve the ability to think, reason, and solve problems" (p.149). According to this statement, it is essential to teach for understanding and language plays an important role to achieve this purpose.

Traditional instruction in mathematics.

Usually mathematics has been considered as a knowledge area which deals with absolute truth, and it has been taught this way for generations. "Mathematical truth is absolutely certain…mathematics is the one and perhaps the only realm of certain, unquestionable and objective knowledge" (Ernest, 1991, p. 3). Absolutism in mathematics has been a predominant paradigm that has framed its education all over the world for decades.

Ernest (1991), in his book "Philosophy of Mathematics Education," explains about the three philosophical approaches (logicism, formalism, and constructivism) that have framed mathematics and their influence in teaching.

Logicism, whose major proponents are Leibniz and Frege (1893), Russell (1919), Whitehead and Carnap (1931), states that mathematics are supported on two main principles "all the concepts of mathematics can be ultimately be reduced to logical concepts…, and all mathematical truths can be proved from the axioms and rules of inference of logic alone" (Ernest, 1991, p. 9). However, both principles have been objected and refuted. Godel's Incompleteness Theorem states that the "deductive proof is insufficient for demonstrating all mathematical truths… the successful reduction of mathematical axioms to those of logic would still not suffice for the derivation of all mathematical truths" (p. 10).

Formalism, the second philosophical approach to mathematics, on the other hand, states that "mathematics is a meaningless formal game played with marks on paper, following rules" (p.11). Similar to logicism, formalism also has two main claims. The first one claims that "pure mathematics can be expressed as uninterpreted formal systems in which the truths of mathematics are represented by formal theorems" (Ernest, 1991, p. 11). The second claim states that "the safety of these formal systems can be demonstrated in terms of their freedom from inconsistency, by means of meta-mathematics" (p. 11). This approach was also refuted, since "not all the truths of mathematics can be represented as theorems in formal systems, and furthermore, the systems themselves cannot be guaranteed safe" (p. 11).

Finally, Ernest (1991) says that constructivism, the last philosophical approach to mathematics, claims that "classic mathematics may be unsafe" and they need to be "rebuilt by the "constructive" methods of reasoning" (p. 12). According to constructivism, "both mathematical truths and the existence of mathematical objects must be established by constructive methods" (Ernest, 1991, p. 12). This approach points to a more intuitive learning of mathematics; however, the fact that mathematics is absolute persists.

All of these philosophical approaches have fostered educational strategies to teach mathematics in order to fulfill the academic needs and demands. Oldham, van der Valk, Broekman, and Berenson (1999) describe how these approaches have influenced the teaching of mathematics in the last decades. Based on Howson (1991), Oldham et al.

explain that by the 1960's the predominant approach for teaching mathematics was the "modern mathematics," which emphasizes mathematical structure. This teaching approach waned during the 1970's and, for some time, no one philosophy exercised as great an influence (Howson, 1991, p. 15). Later, however, "realistic" mathematics education arose as a reaction to modern mathematics (Oldham et al., 1999, p.24). Its main characteristic is "mathematics as a human activity and the use of context as sources for learning mathematics" (Oldham et al., 1999). This perspective is more dynamic and student-centered since it aims at solving real life problems within specific contexts and goes beyond structural mathematics learning and points to a more constructivist-type of learning.

Due to all of these approaches and philosophies, governments are periodically studying their education systems and are adjusting their national curricula in order to achieve current standards. For instance, in Colombia, in 1971, the Ministry of Education and the Colombian Institute of Pedagogy, in an attempt to improve current mathematics teaching at that time, conducted a mathematical research study in order to report findings and provide "new methodological guidelines" for the teaching of math. They suggested "elementary-level learning activities for helping the students develop thinking processes and powers of generalization and abstraction through the observation of concrete objects" (Parot, 1971, p.3). This study has been an important basis for further curricula guidelines which have ruled the teaching of mathematics in the last decades. The Colombian Ministry of Education is currently implementing a national guideline for schools named "Lineamientos curriculares" for mathematics which detail the content and skills required for each learning level in primary, middle, and high school. This guideline has been used for schools as a base for curriculum design in most of the Colombian schools.

New strategies to teach mathematics effectively.

Due to the world's current demands in terms of development of competences in mathematics skills and abilities, new methods and pedagogies have arisen as consequence of analysis and research. Many authors have been working to develop strategies and pedagogies to help teachers design and carry out math lessons effectively. Tools such as Thwaites's (2008) "One hundred ideas for teaching primary mathematics" are helpful guides for teachers because they are a compilation of successful classroom activities carried out by Thwaites at Sandown School, Hastings. The book is divided into four sections. The first section shows forty eight ideas to develop "short number activities and games" which are perfect to begin lessons or when students finish early. The author suggests that they can also be used in combination for a longer period of time. The second section points to the development of investigations and longer activities. In this case, the teacher has twenty ideas to design investigation and more elaborate activities in order to develop higher-order thinking skills. The third section focuses on seventeen activities to train skills for measuring and time. And the fourth section has to do with the development of skills related to shape, space, and design. According to the author, "these final 16 ideas capitalize on children's enjoyment of exploring shape but take it further to extend manipulative and design skills. Some incorporate the investigational with the creative while promoting greater accuracy and a sense of achievement" (p. 111). The strategies and activities presented in the book are different from the conventional teaching of mathematics. The students have opportunities to think, plan, and find different alternatives to solve a problem or a question. In addition, the teacher can find differentiation activities that can help to guide those children who may find the tasks difficult. Another advantage of these types of activities is that the learners can discover that learning mathematics could be fun.

Another author who is working to change the paradigms of traditional mathematics instruction is the Colombian mathematician and teacher Carlos Diez. His method points to develop the ability to learn how think mathematically. Diez (2016) has designed a strategy which points to the development of "competent readings." He focuses his research on designing mathematical problems with the structure of a story. In order to develop language and thinking skills, Diez has designed a "problem solving algorithm" which is divided in seven stages. The first three stages develop the ability to interpret the information and transfer it into mathematical connotations. The first step, "vital purpose," aims at identifying the main purpose of the problem (what must be done). The second stage, "information emptiness," challenges the learner to identify what information needs to be found. And the third stage, "mathematical object," helps the leaner to identify the math content required to solve the problem.

The fourth and fifth stages help the learners to design and develop a plan to solve the problem. In the fourth stage, called "strategy," the student has to analyze the possibilities, state a hypothesis and make a plan to solve the problem; while in the fifth stage, the student has to develop a "mathematical product" in which the learner has to test the hypothesis and record the results. Finally, in the stages six and seven, the students have to "express" their findings. In the sixth stage "product of information," the students have to share their findings and draw conclusions from the hypothesis; and in the last stage, "implications and decisions," the students have to reflect on the implications of the problems, which decisions may help to solve the problem, and ask questions about what else could be learned from the solution of the problem. This algorithm may be another successful tool for math teachers because it helps learners to decode information, transfer it to mathematical language, design a plan based on a hypothesis, test the hypothesis, and communicate findings thinking about implications and challenges the learner to think about own knowledge and develop curiosity for other topics implicit or explicit in the problem.

Mathematics and CLIL.

Many specialized non-bilingual teachers in Colombia still have questions about learning mathematics in a language different from the native tongue; in fact, some argue that many times learners achieve little performance in the subject due to lack of understanding when transferring from English to Spanish. If it is the case, why do students from monolingual schools in Colombia achieve in some cases lower scores in mathematics than most bilingual schools learners at national examinations? This means that a deeper analysis is required to really find the origin of the problem.

Regarding learning mathematics in other languages, Barwell (2009) states that “being highly proficient in two or more languages gives cognitive advantages to students, while proficiency in only one language offers neither advantage nor disadvantage. A number of studies have been based on the assumption that any cognitive advantage or disadvantage will show up in students’ levels of mathematics achievement” (p. 5). Learning mathematics in English may result advantageous, indeed. Barton (2008) explains that “English is more aligned to the way things are expressed in mathematics. English, with its own grammar of number, allows us to express the operations of multiplication and addition in the way that they are intended to be understood mathematically" (p. 50-51). According to this assumption, learning mathematics in English may provide more tools for understanding to the students; therefore, there would be more opportunities to develop better skills and processes that improve the probabilities of success in learning.

Another aspect related to learning mathematics in English has to do with the growing need to access information. Most engineering, medicine, physics, and other areas are producing research, reports, books, and other learning materials in English. Therefore, leaners need to be trained in order to handle and understand content either in national or international universities; for that reason, learning mathematics in English has become a plus that might really help Colombian students become more competitive. Coyle et al. (2010) state that "this need has often dovetailed with the need to adapt content-teaching methodologies so as to raise overall levels of proficiency, particularly since the introduction of global comparative measures ranking individual countries through the Programme for International Student Assessment (PISA) of the Organisation for Economic Cooperation and Development (OECD)." (p. 2). But many could ask why CLIL and how worthy learning mathematics using CLIL is.

The language of mathematics is universal, but it is necessary that it be learned. Carrasquillo and Rodriguez (2001) argue that "mathematics is a language that expresses the size, order, shape, and relationship among quantities. It has an established vocabulary, syntax, semantics, and discourse based on representational symbols in its various branches including arithmetic, algebra, geometry, calculus, and number theory" (p.150). This is the reason that supports the pertinence of CLIL as a strategy to precisely learn the language of mathematics and transfer the mathematical language in order to choose the appropriate strategy and carry out accurate operations to solve a problem.

It is vital to learn mathematics terms and terminology which are usually new for learners even in their native language. Therefore, when learning mathematics in another language, it is mandatory to verify that this language is very well acquired. With regards to this idea, Carrasquillo and Rodriguez (2001) state that “the language of mathematics is composed of a complex set of phrases that describe a concept. In this mathematical abstraction two or more mathematical concepts are combined to make a new concept, compounding the task of comprehending the words as a very important component of the process” (p.152). Consequently, CLIL lessons have to be carefully planned in order to effectively help learners accomplish content, general language, and academic language objectives which also include decoding symbols and interpretations from culture to culture. For example, in Colombia, a decimal is represented with a comma, e.g. 3,456, but in other cultures this might be read as three thousands, four hundred and fifty six; thus, learners have to be trained to understand the differences and learn to deal with them. Barwell (2005) concludes from a study he carried out about issues from the mathematics classroom when integrating language and content in mainstream classrooms that “language and content can be seen as reflexively related, and as mediated by the social activity in which they are engaged” (p. 217). This means that teaching the content and the language in isolation might make learning mathematics meaningless; therefore, the learners could find mathematics as something apart from their social context and probably useless for their lives.

Qualities of a good mathematics primary teacher.

Based on a study on mathematical investigations for supporting preservice primary teachers repeating mathematics education course in New Zealand, Bailey (2014) lists several aspects that are important in order to be an effective primary mathematics teacher. Bailey believes that good primary teachers should:

- Provide positive learning experiences which will eventually produce positive beliefs and attitudes towards mathematics.
- Create a mathematical learning environment that includes collaboration, inquire-based projects, and support with mathematics content.
- Be innovative by adapting and adjusting new practice to particular students and contexts.
- Choose carefully learning and assessment tasks. The design of these is regarded to be a crucial aspect of supporting the development of a sound understanding about learning and teaching.

This chapter has provided an in-depth view of many aspects of CLIL and mathematics that have served as a foundation for the research project described in this thesis. These perspectives guide the method and design, which will be described in the next chapter.

III Research Method and Design

This section aims to describe the paradigm, type of study, and data collection instruments necessary to collect reliable evidence in order to find out how math teachers at primary level in GLC are implementing CLIL in the classroom. The information collected will help identify aspects such as how the current methodology is being implemented, how teachers are focusing on general and subject-specific academic language, and how content is being developed. The information collected will be crucial to discover how the dynamic of the lesson takes place, what happens in the classroom in current math lessons, and to identify how CLIL is used in the classroom in this particular context.

Research Paradigm

Research requires a methodological approach that supports and gives structure to the study, so the researcher needs to make decisions about the methodology that best achieves the objectives of the study. For authors such as Travers (2004), Heaton (2004), and Merriam (2014), there are three main paradigms that have framed research: positivism, interpretivism (or social constructivism), and realism which are described as follows.

Positivism has basically framed the scientific method. It claims that reality is "observable, stable, and measurable. Knowledge gained through the study of this reality has been labeled 'scientific' and included the establishment of 'laws.' Experimental research assumed a positive stance" (Merriam, 2014, p. 8). According to Heaton (2004) quantitative research and natural sciences are closely related since both are "associated with positivist and realist epistemologies" which claim that the social world as well as the natural world exist independently; therefore they can "be observed through scientific methods" (p. 55). In addition, Travers (2004) relates that in the human sciences, realism is the most widely used paradigm because it "involves looking behind appearances to discover laws or mechanisms which explain human behavior" (p. 11). This paradigm is relevant for the type of research that points to collecting exact data in order to test hypotheses and demonstrate phenomena previously predicted. It is favorable for scientific experimentation and research; it is precise, objective, and has little or no possibility of subjective or social interpretation of results. Therefore, this paradigm would result inappropriate for the purpose of this research.

Interpretivism or social constructivism, on the other hand, believes "that the objective of sociological analysis should be to address how members of society understand their own actions" (Travers, 2004, p. 10). Regarding representativeness, positivism, and constructivism would focus on different aspects. While "a positivist would spend a lot of time devising a sampling procedure, an interpretive sociology might want to know members of society understand the issue of representativeness" (Travers, 2004).

Due to the nature of this particular research project which aims at discovering what happens in daily math lessons in primary at GLC, it is necessary to carry out a qualitative approach. Therefore, the knowledge claim will be framed in social constructivism. According to Creswell (2003), this approach focuses on understanding the world in which participants work or live and it is supported on multiple meanings of experiences that lead "the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas" (p. 8).

Social constructivism allows the researcher to interact with the people involved in the study, in a specific context; thus, the researcher also is able to listen and observe what participants do or say in their particular context (Creswell, 2003). For this case, social constructivism will perfectly frame the needs of the present study because its main aim is to understand the actual development of primary school math lessons at GLC. The interaction with the participants and the interpretation of the context in which the teaching takes place is important to understand the causes of the current issue, since there can be different factors that might be affecting the learning process of mathematics in primary at GLC.

With respect to this paradigm, Merriam (2014) states that "interpretive research, which is where qualitative research is most often located, assumes that reality is socially constructed, that is, there is no single, observable reality" (p. 8). As a result, it is necessary to consider different aspects that may influence the reality being observed. A single phenomenon may be interpreted from different perspectives, obtaining different explanations for the same event or situation; thus, a single interpretation might result insufficient to describe the reality.

For the purpose of this study, it is imperative to avoid assumptions or hypotheses and aim to find the aspects that are affecting the results in mathematics in this specific context (GLC). Patton (as cited in Yilmaz, 2013) supports this argument when declaring that "since qualitative findings are highly context and case dependent, researchers are expected to keep findings in context and report any personal and professional information that may have an impact on data collection, analysis, and interpretations" (p. 315). Any judgment from the researcher or any other type of personal interpretation out of context takes away reliability from the data, biases the information, and manipulates findings. The information must be presented exactly as it is, with no changes and avoiding predictions or any type of decontextualized evaluation.

Qualitative Method

Choosing the method to guide the research is a fundamental task. Initially, it is crucial to have clarity on the possibilities in order to decide the most convenient for each case. There are basically two methods to carry out research: qualitative and quantitative.

Quantitative research is more related to positivism. Yilmaz (2013), citing Creswell (1994) and Gay and Airasian (2000) defines this type of method "as research that explains phenomena according to numerical data which are analysed by means of mathematically based methods, especially statistics" (p. 311). As positivism, quantitative research is useful for the type of research which aims at testing a hypothesis. Data collection instruments are mostly centered in tabulations, measuring and analyzing variables, recording results in a numerical structure, and expecting a previously predicted result. Creswell (2003) explains that quantitative research includes strategies such as "the true experiments and the less rigorous experiments called quasi-experiments and correlational studies, specific single-subject experiments…[and] complex experiments with many variables and treatments" (p. 13). All of these strategies aim at collecting evidence to confirm or deny a previously stated hypothesis.

In contrast, Heaton (2004), making reference to Bryman (1988) states that "qualitative research is associated with different intellectual positions, such as phenomenology, symbolic interactionism, and naturalism.... [All of them] assume that there is no single reality but multiple realities which are contingent on intersubjective understanding" (p. 55). Therefore, qualitative research is open to a variety of possibilities to describe, define, or explain a phenomenon from different perspectives and does not limit the research to testing in order to confirm or deny a previously stated hypothesis.

Kemparaj and Chavan (2013), list some characteristics of qualitative research which summarize the nature of this method. It involves the following:

- Analysis and generation of narrative or non-numeric information
- Intensely involved researchers, often remaining in field for lengthy periods of time
- Exploration of phenomena from the participant's perspective and a focus on meaning and understanding
- Emphasis on social context and the study of phenomena in the natural environment rather than in experimental settings
- Flexible data collection and analysis to allow for the exploration of emergent issues
- Generation of distinctive output in the form of detailed descriptions, classifications, typologies, patterns of association, and explanations.

In the educational field, qualitative research is not new (Freebody, 2006). Because of the anthropologist and humanistic nature of education, qualitative research has become a significant method to study concrete issues related to this area of knowledge. This is another reason to consider the qualitative method as an effective choice to approach the research questions of this particular study. Freebody (2006) mentions that "research has come for several purposes in education. At the most general level, a major purpose is to provide principled bases for 'knowing' to guide practice and policy" (p. 20). In this case, the study aims mostly at guiding practice in the classroom because the research questions aim at identifying how CLIL is being implemented in order to teach mathematics in primary level at GLC. The main objective of the research focuses on discovering what happens in the classroom rather than testing a hypothesis.

Type of Study

According to the objectives of this study, the most pertinent method to use is a qualitative research framed on the epistemology of social constructivism. In order to find evidence to identify how a current math lesson is held at GLC, it is vital to live the experience as a case study which allows for the recording of data supported on the fact that it is necessary to understand how the participants in this learning environment interact in order to build up knowledge and skills in terms of content and language, essential to learn mathematics in primary levels.

Thus, the method chosen for this purpose has to provide a descriptive evidence of the phenomenon and it is essential that the researcher gets immersed in the cultural context of the study. Gillham (2010) defines a case study as "one which investigates to answer specific research questions (that may be fairly loose to begin with) and which seeks a range of different kinds of evidence, evidence which is there in the case setting, and which has to be abstracted and collated to get the best possible answers to the research question" (p.1). In addition, Merriam (2014) defines it as "an in-depth description and analysis of a bounded system" (p. 40). As a case study is mostly qualitative in nature, it focuses on human phenomenon, as in this study, which will focus on the dynamic of a current math lesson: how lessons are carried out in terms of learning the content and supporting the language; the interaction of teacher-students; and the interaction of students-students in an academic context.

Another aspect about case studies has to do with the analysis of thinking processes that take place during interactions in the classroom. These types of studies can help to understand the dynamics of the class in terms of such interactions. Woodside (2010) explains that “approximately 95 percent of thought is subconscious and that people have only limited access to their own thinking processes, not to mention the thinking processes of others” (p. 2). Consequently, it is impossible to know people’s thoughts unless they are explicitly shown either in the specific case of voluntary sharing of ideas or in an interview which intentionally challenge the interviewees to reflect on their own thoughts and their perceptions about an issue or situation. Woodside also concludes that “interviewing the multiple participants involved in the thinking/doing under study (e.g., Biemans, 1989) not only are particularly useful steps, but also they become mandatory if we really want to achieve deep understanding in research on thinking/doing process” (p. 2).

This case study will also be supported on some ethnographic principles in order to verify the reliability of the evidence collected, especially because observation will be the most significant instrument in this research, so ethnography becomes a strong part in this phase of the process. Maggs-Rapport (2000) explain that “ethnographic studies normally concentrate on the routine, daily lives of people, allowing for a number of views to be examined at the same time…data are collected through an intensive period of observation, discussion, or ideally a mixture of the two” (p. 220). Although in this case study, there will be no total immersion in terms of observing all the classes in the term, the study aims at observing each teaching group at least twice; therefore, the observer will have material to analyze the methodologies, pedagogies, behaviors, interactions, and teaching in terms of language and content.

Ethnography often uses other instruments such as interviews and document analysis which are useful for the purpose of this research. Crowley-Henry (2011) supports this fact when stating that ethnographic studies allows the researcher to choose a variety of different methods which depend on the nature of the study "and the methodological positioning of the researcher" (p. 35) in order to effectively answer the research question(s). These methods normally "include interviews (structured or exploratory), observation (keeping dairies, writing fieldnotes), collecting narratives, undertaking document and/or historical research, participation in the context (and accumulating first-hand, contextual information about the culture or population sample in the question)" (p. 35).

Data Collection Techniques and Procedures

The following sections provide a description of the participants involved in this study as well as detailed information related to the specific data collection instruments that were used for this research. First, there is a general description of the merits of each instrument along with the rationale behind the choice of each for this particular study. Then, the chapter describes the specific procedures followed in this study.

Description of participants.

This study is focused on finding what is happening during math lessons in the primary level at GLC; how CLIL is being implemented in class; and how language and content are addressed in the lessons. In order to achieve the purposes of the study, the three math teachers who teach from first to sixth grade at GLC will play an important role since they will be observed and interviewed in order to collect information that help to answer the research questions. For effects of this study, the teacher participants will be called Patty, Betty, and Glory, which are not their real names.

Patty is a business administrator who started teaching in 2007 at GLC. She has a vast knowledge of mathematics and took a course in pedagogy at Escuela Normal in order to work as a teacher. She has experience teaching at the primary level. She is currently teaching in fourth, fifth and sixth grade. Patty completed 130 hours of training in CLIL with the British Council and obtained the certification for completing the CLIL training Programme for Aspaen schools. She was also certified with the TKT CLIL.

Betty has been working at GLC since 2013. She is an alumnus of the school. She also has a degree in business administration, but she decided to be a teacher. She has already worked as math teacher in other schools in the city before starting at GLC. She completed a course in pedagogy in order to have a teaching license. Although she did not complete the 130-hour CLIL training for Aspaen schools with the British Council, she has been sent often to training sessions in math with the British Council. Betty took the TKT CLIL exam and passed it with a good score. She is currently teaching in second and third grade.

The last teacher is Glory. She studied early-childhood pedagogy at a local highly-ranked private university and she is currently teaching first graders. Most of her experience is as a preschool co-teacher. She has worked in different schools in the city and is teaching mathematics at GLC for the first time. She has no experience in CLIL; therefore, she does not have any certification in CLIL, neither Aspaen's nor the TKT CLIL. However, she has received three training sessions and direct support from the bilingual coordinator and the other CLIL certified teachers. Gory is teaching in first grade.

Techniques and procedures implemented.

According to the aims of this study, it is essential to design effective instruments in order to collect information to answer the research questions. In this case, the data collection instruments implemented for the research were classroom observations, individual structured interviews to teachers, and document analysis (i.e., the analysis of the curriculum in terms of content and learning objectives in the first term of the school year). Because it is important to collect factual evidence in a way that allows for the researcher to have a real picture of the situation, it is vital to use the most accurate strategy to present the evidence in an objective way. Therefore, in this study, the instruments had to provide reliable information that explains how CLIL is being implemented in primary levels at GLC. According to Altheide (2010), "evidence is not about facts per se, but about an argument, a narrative that is appropriate for the purpose –at-hand. That means it is contextualized and part of a bounded project" (p. 138). Therefore, the observations in the context of the classes, the individual interviews to teachers, and the analysis of the first term in the math curriculum at GLC precisely provided arguments appropriate to answer the research question and the sub-questions that frame this study.

Observation.

Ely (1991) states that "the most essential means of gathering ethnographic data are looking and listening" (p. 42), and observations allow the researcher precisely look and listen how phenomena take place in a specific context. In order to observe the pedagogy implemented in class, the student and teacher interaction, and how the general and academic language is addressed and taught in current math lessons in primary at GLC, observations were made as the main source of information for this study. Observations provided information from the origin of the phenomenon, in this case the class. In order to make it as reliable as possible, each observation was closely focused on the research question, and framed on CLIL principles in order to identify CLIL characteristics in the lessons. According to Merriam (2014) “observation is a research tool when it is systematic, when it addresses a specific research question, and when it is subject to the checks and balances in producing trustworthy results” (p. 118). The purpose of the tool in this study aims at identifying whether the methodology implemented in the classroom is framed according to CLIL principles or other approach.

It was planned to carry out six observations, two per grade; therefore, each teacher was observed at least two times while teaching different grades. The classes were audio recorded in order to collect as many details as possible. At the same time, the observer took notes of important details observed during the lesson. After that, the observations were transcribed and analyzed. The analysis of the observations was done based on rubrics designed by the researcher with the main characteristics of a CLIL lesson, all of them collected in an observation template previously designed for that purpose (see appendices 4 and 5 for these observation templates and rubrics). In order to collect reliable information, this observation process was done with no previous warning; thus, the teachers developed their lessons as naturally as possible.

The observations were an advantageous source of information because this technique allowed the researcher “live” the class in its context; the observer listened and saw what happened in the different classes; observed how each teacher carried out the lesson, how the content and the language were taught, and how the teacher supported the students in order to help them learn. The observer directly collected evidence on how CLIL was being implemented in the class and also observed how students interacted with the teacher and their classmates during a math lesson.

However, there are two aspects that may have been disadvantageous during the observations. First of all, as the observer is the CIE coordinator, so probably the teachers might have felt intimidated because the observer is an authority figure over them. As a result, some seemed to be uncomfortable at the beginning of the class, but they became confident as the class evolved. Most likely, they did not want to be judged or evaluated. To mediate this situation, there was a previous conversation with the teachers. The researcher explained the purpose of the observation and emphasized that there were no punitive consequences for their performance in class. A second constraint was in terms of the students. Being observed in the class seems to have caused a type of pressure over some of them. As a result, some students seemed to feel shy about participating in class and their actions may have varied from those that would usually be present in the classroom. Therefore, the observer tried to act as invisible as possible in order to avoid any type of abnormal behavior in the students.

Because of the seriousness of this data collection instrument, Merriam’s (2014) content parameters for making effective field notes were taken into account.

- There are verbal descriptions of the setting, the people, and the activities.
- They include direct quotations or at least the substance of what people said.
- The document also contains observer's comments. In this case, there is a column on the right with the heading "comments" in which the observer writes impressions based on the observations. (p. 131)

In order to analyze the results obtained from the observations, the researcher categorized the information according to the research questions. Consequently, the information was classified into four main categories: information focused on the methodology implemented in the class; information related to how general language is focused in the math lessons; information related to subject vocabulary and how it is being focused in the lessons; and information focused on how content is being focused during a math lesson.

Interview.

As a complement to these observations, this study also included two individual structured interviews with each teacher which took place parallel to the observation process. Mason (2002) clarifies that interviews allow the researcher to approach people in order to "construct knowledge" by "talking, listening and interpreting what they say and how they say it" (p. 225). In this study, interviews were useful to help the researcher either to explain some findings or understand the teachers' point of view regarding their daily teaching of mathematics at GLC. It was necessary that the researcher understands the teachers' perceptions about teaching mathematics and how familiar they are with CLIL;

how much they know about this topic; and how they implement this approach in the classroom. Consequently, interviews were needed to collect this information.

Ely (1991) explains that there are two types of interviews: informal and formal. The first type, informal interviews, which could be held during observations if there is time available, are more likely a spontaneous conversation, with little prior planning and could be about a situation or a particular question that arose during the observations. On the other hand, the formal interview requires thoughtful planning and the design of specific questions to be previously elaborated. Formal interviews are often "held even in special places (maybe a locked room) in order to be more formal" (p. 57).

These interviews used in this case study were previously planned. A first interview was made up of eleven questions which provided information about the teachers: experience teaching mathematics, time working at GLC, how familiar they are with CLIL, usefulness of the methodology, how CLIL is being implemented in class from the teachers' perspective, strategies to teach the content and the language, and how they teach academic vocabulary and general communicative skills in the math lesson. Each question was designed to answer the main research questions as well as the secondary research questions. Appendix 6 shows a chart in which there is a detailed explanation of the purpose of each question.

During the observations, the researcher started wondering about some aspects related to language support which were not noticeable in the observations. In order to inquire more about these issues, a second interview was designed. It was made up of six questions which aimed at finding detailed information related to: language support in class, scaffolding, and awareness of functional language in terms of achieving outcomes required in the curriculum, and language evaluation in the math lesson. As in the first interview, all the questions in this second interview were directly related to the research questions (see Appendix 7 for detailed information).

The interviews were held in a private room, individually, and they were handled in total confidentiality. They were audio-recorded in order to save all the information obtained from the teachers, and then they were transcribed in a template previously designed. The purpose of the template was to keep track of the conversation and write comments and insights for analysis (see Appendix 8).

The first interviews were carried out between September 4 and October 5, 2015. The first teacher interviewed was Betty. She is currently teaching in second and third grade and she was interviewed on September 4. Patty, who teaches in fourth, fifth, and sixth grade, was interviewed on September 17. Finally, the last teacher interviewed was Glory. She teaches in first grade and her interview was held on October 5. The second interviews were carried out on December 10, 2015. On that day, the researcher asked for special permission from GLC to carry out the interviews; therefore, it was possible to meet with the teachers in their free hours. Betty was interviewed at 8:35 am, Patty was interviewed at 10:45 am, and Glory was interviewed at 1:30 pm.

The interviews were advantageous because the researcher could determine aspects which were not evident in the observations. The interviews provided information related to relevance and support of academic and general language during the lessons, perceptions about CLIL, and how new vocabulary is introduced in order to help the students understand the mathematical language. The interviews also helped the researcher have insight into the teachers' thoughts regarding CLIL as a class experience. However, carrying out the interviews was not an easy task. There were difficulties in the scheduling of the interviews since the teachers' and the researcher's availability often did not coincide.

Analysis of documents.

Another important source of information is the analysis of documents which can provide interesting findings for the researcher. In order to support the observations, the math curriculum was also analyzed. From the curriculum, it was expected to identify the content, outcomes, competences, and standards that frame the teaching and learning process in mathematics during the first term of the school year.

In order to collect the information required from the curriculum, a template was designed as a tool to ease the collection of the data that supports the aims of the research (see Appendix 9). The template allows the researcher to record specific information related to standards, learning objectives, content, language objectives, and vocabulary explicit in the document. The school allowed access to the documents required for the research with no restrictions.

This source of information is supported by Merriam (2014) who considers documents to be very useful because, first of all, they do not depend "upon the whims of human beings," as in observations or interviews as they are already "a ready-made source" (p. 139). They are much easier to access than other sources. In addition, documents do not interrupt in the setting; thus, the researcher may work with them in a less crowded and probably more comfortable place.

Triangulation of the Data

In order to verify the validity and reliability of this study, triangulation was carried out based on all the data collected during the study. Maggs-Rapport (2000) asserts that "triangulation promotes the validity of data findings by allowing the researcher to explore a phenomenon more fully whilst facilitating a variety of methods to encourage comprehensive understanding and explanation" (p. 222). Maggs-Rapport (2000) also clarifies that triangulation might take place at any moment during the research process. For the purpose of this study, triangulation started during the design of the data collection instruments since all of the instruments ought to gather information to answer the research question and fulfil the objectives of the study, the questions for the interviews, the observation template, as well as the curriculum analysis template were carefully designed in order to ensure finding plenty evidence that allows the researcher explain what happens in the classroom during a current math lesson and to compare these data with those collected with the other instruments. After collecting the information, triangulation was useful in seeing where the data overlapped, where it differed, and to draw conclusions from the data collected.

Denzin (as cited in Hitcock and Hughes, 1995), explains that there are four types of triangulation: (1) data triangulation, taken from data collected over a period of time from more than one location or form or about more than one person; (2) investigator triangulation, which involves the use of more than one observer for the same object; (3)

theory triangulation in which the researcher can involve different kinds of approaches in order to study more than one category of analysis; and (4) methodological triangulation "which means the use within a data collection format, of more than one method of obtaining information" (p. 324). For this study, the most suitable type of triangulation is the methodological triangulation. Due to the nature of this research the data to answer the research question ought to show the dynamic of current math lessons from different perspectives: what is expected to be achieved (analysis of the curriculum), how teachers think they develop the class (interviews), and how the lesson is actually carried out (class observation). Obtaining information from different sources validates the research and allows the researcher analyze the phenomenon from more than one point-of-view.

The triangulation was carried out as follows. First, the researcher classified the information obtained from the observations, the interviews, and the analysis of the curriculum according to the research questions aimed to be answered in this study. Secondly, the researcher made the analysis of all of the lessons observed to each teacher and pointed how CLIL aspects were developed in most of the lessons. Later, the researcher compared the analysis of the lessons observed with the analysis of the information obtained from the interviews and the curriculum analysis. Finally, the researcher analyzed how the information collected answered each research question.

In order to illustrate the triangulation process, the following triangulation table was designed by the researcher as a tool to describe how the techniques were implemented and what the aim of each one was.

Table 1

Research question: How is CLIL being implemented by math teachers at GLC in primary levels?		
Objectives	Techniques	Aims for analysis
Identify the current methodology implemented to develop math lessons at GLC.	-Class observation (two observations per class from first to sixth grade) -Formal interview to math primary teachers	• Observe directly and collect information related to the methodology implemented in the classroom. • Collect teachers' thoughts regarding strategies and methodologies they implement in the classroom.
Determine how general language is focused on in current math lessons at GLC.	-Analysis of curriculum (only the first term of the school year) -Formal interview to math primary teachers -Class observation(two observations per class from first to sixth grade)	• Determine how general language is addressed in the curriculum. • Collect information from the teachers regarding the strategies used to support general language in a math lesson. • Observe how general language is addressed in the class.
Determine how subject academic language is focused on in current math lessons in at GLC.	-Analysis of curriculum (only the first term of the school year) -Formal interview to math primary teachers -Class observation(two observations per class from first to sixth grade)	• Determine how subject academic language is addressed in the curriculum and what academic language is expected to be taught in the first term. • Collect information from the teachers regarding the strategies used to teach subject academic language in a math lesson. • Observe how subject academic language is addressed in the class.
	-Analysis of curriculum (only the first term of the	• Determine the content expected to be taught in

Establish how content is focused on in current math lessons at GLC.	school year) -Formal interview to math primary teachers -Class observation(two observations per class from first to sixth grade)	the first term according to the curriculum. • Collect information from the teachers regarding the strategies used to teach the content in a math lesson. • Observe how the content is being taught in the math lessons.

Ethical Considerations

An important issue in research is veracity and validity of the study, and it is vital to provide all the ethical conditions necessary to precisely ensure transparency and reliability during and after the process. With regards to this, Merriam (2014) claims that "ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner" (p. 209). Related to this, the researcher has to design and develop a serious plan which fulfills all the conditions to avoid any type of ambiguity in the collection of the information, protect the integrity of the participants involved in the research, and ensure all the conditions required to collect information in a fair way. All of these aspects are framed on responsibility and trustfulness from both the researcher and the participants.

Cohen, Manion, and Morrison (2007) explain some concerns related to "procedural ethics issues" that define the validity of research. The authors state that in terms of research "ethics concern right and wrong, good and bad, and so procedural ethics are not enough; one has to consider how the research purposes, contents, methods, reporting and outcomes abide by ethical principles and practices" (p. 51). Therefore, the researcher must be careful when making decisions that could benefit the research but could affect any of the participants.

It is true that during the research process, there are a series of ethical issues that arise for different reasons. In an interview, for instance, a teacher may speak about personal or embarrassing situations which can be difficult to publish. The same might happen during the observation process where there may be some circumstances that could be embarrassing for the participants. As a strategy to protect the identity of the participants and foster confidentiality in the study, the sample’s names were changed. Thus, as mentioned earlier, Patty, Betty, and Glory will be the names used in order to refer to the participants during the whole research process.

There also were some aspects agreed upon by the teacher-participants which are described as follows. First, the researcher had individual meetings to explain the nature of the study to the teachers and to formally ask them to participate in it. Second, each teacher was assigned a pseudonym in order to protect their identities, and, finally, each teacher signed a document in which they gave their consent to be part of the research study. The researcher was committed to not publish any embarrassing situation either during the interviews or the observations.

Furthermore, in order to protect the learners in the study, students were not mentioned in the report of the results of the observations. There is a general description of how the whole class developed the lesson. In case of any particular situation that deserved to be mentioned in the study, no names of students were used in order to keep students anonymous and to protect their identity.

IV. Results and Analysis

This section provides a detailed report on the information collected after the application of the three instruments chosen for this study: interviews to teachers, class observations, and the analysis of the first term of the first to sixth grade mathematics curriculum. Each instrument aimed at collecting information in order to find evidence to answer the research question and the secondary questions that frame this case study, as seen below:

How is CLIL being implemented by math teachers at GLC in primary levels?

Secondary questions:

1. What current methodology do primary math teachers at GLC implement to develop their lessons?
2. How is general language focused in current math lessons at GLC's primary level?
3. How is subject academic language being focused in current math lessons at GLC's primary level?
4. How is content focused on in current math lessons al GLC's primary level?

Results from Interviews

The following section describes the results on the purpose of each question in the first and the second interviews and how each teacher responded to them (see questions and purposes in the appendices 6 and 7). A summary of what the teachers said during the interview follows along with the reference to the transcript and the turn (signaled with a #; Appendix XX, #xx) where the exact words of the teachers may be reviewed.

Teacher interview 1.

To begin the first interview, each teacher was asked how long they had been teaching math in their whole career and how long they have been teaching math at GLC, specifically. Betty has been working as a math teacher for six years, four at GLC and two in other school. Patty has been teaching mathematics for eight years, and all her experience has been at GLC. On the other hand, Glory has taught math as a co-teacher for five years, but this is her first experience teaching as head math teacher. She has been working at GLC for two months.

When asked about the teachers' knowledge of CLIL and familiarity with this approach, Betty responded that CLIL is the methodology used at school and that Cambridge teaches it. She probably means that she knew about it when GLC became a Cambridge associate school. She defined CLIL as "content language integrated learning" and states that they have to implement it at school. She explained that CLIL has some stages that they have to develop in the class. She says she likes it very much because the class could be more fun (Appendix 10, #14). On the other hand, Patty described CLIL as a methodology used in many schools around the world because it helps students be more confident, the classes are more dynamic, and they can do many activities; besides, they can use different strategies. It is possible that she means that CLIL allows them develop a variety of teaching strategies to teach mathematics. In addition, learning is focused in on the student and not on the teacher. She thinks it is helpful. (Appendix 12, #8 and #10). Conversely, Glory expresses that she is just becoming familiarized with CLIL since she is a new teacher to the school. She mentioned that she has tried to use CLIL in the classes. She believes that CLIL is related to the context and everyday problems (Appendix 11, #12).

Question four aims at gathering information to determine how teachers implement CLIL in their math lessons at GLC. To this question, Betty explained that she normally starts the lesson with a motivation activity in order to engage children with learning and the topic to be learned. She also said that she uses activities such as scaffolding, the hot seat, throwing a ball to answer questions. They use manipulatives to experiment, and they have a wrap up activity to "finish the class understanding what they learned" (Appendix 10, #16). Patty also described the stages of the class that she uses during her lessons. She mentions a warm up, modelling, and students working either independently, in groups, or walking around the classroom (probably she means in an activity such as "the carrousel"). She mentioned that students think they are playing while learning mathematics, but they do not realize that they are learning in a different way. Patty also explained that students evaluate their classmates work by checking with others or in groups, and she also provides feedback at the end of the activity (Appendix 12, #12). Glory's classes are very different. She explained that she tries to work on some activities, but because they are little girls, it is hard for them to keep a conversation or even follow instructions in English. However, she tries to implement problem solving using daily life problems and objects familiar to the girls. Glory did not mention the stages of the class in the interview (Appendix 11, #14 and #16).

The participants were asked about how they work on language aspects in their math lesson. In terms of language, Betty stated that subject vocabulary is very important. She argued that each lesson has inferred specific vocabulary that the students need to manage in order to work on problem solving. She feels that every lesson has specific vocabulary and the students have to learn it (Appendix 10, #20). With regards to this aspects, Patty considers that math teachers at GLC not only teach the specific subject vocabulary such as "plus, minus, times," but they also provide input to the students in order to help them improve general language competence. For instance, when a student uses tenses improperly, they tell the students the correct form of the verb and ask them to repeat the expression using the proper form. According to Patty, they are not only teaching math, but they are somehow "teaching language arts using math" (Appendix 12, #14). Regarding this aspect, Glory says that she tries to develop language by working with specific words, such as "addition, subtraction, taking off, adding" (Appendix 11, #18), so students can use them.

Question six asks specifically how academic or subject vocabulary is being introduced to the students. In relation to this question, teachers described different strategies that they implement to teach new subject vocabulary. Betty, for instance, stated that she works with games and glossaries. She also uses a vocabulary notebook and she says that she can also cover vocabulary within the motivation activity (i.e., warm-up session) she does every day (Appendix 10, #22). Patty, however, implements different strategies. She prefers using cards with definitions, examples or words, so that the students have the possibility to walk around in order to match the cards. She says she gives them the opportunity to try out the task without verifying prior knowledge. She seems to mean that she does not inquire about students' prior knowledge of the words, but while checking the tasks the students make associations of the new vocabulary with previous knowledge. Thus, the students have the opportunity to build up their own definition of the new words (Appendix 12, #16). Glory also uses different strategies. She described how she likes to show different meanings of the new words when the students are learning them. For instance, she uses drawing the signs that are linked to the words and showing the students how they are connected, so they can learn the meaning of the new words by association. “If I am working with taking off, I draw the sign (-)” so the students associate the expression with subtraction (Appendix 11, #22).

Question seven aims at finding information related to how teachers implement strategies to improve general communicative skills in their math lessons and which strategies they use for this purpose. Concerning this question, Betty explained that when it is students’ talking time, she lets the children communicate by using the math vocabulary. If it is too challenging for the learners, she implements strategies such as games, filling in the blanks, or other forms to communicate, either in pairs or in larger groups, using the subject vocabulary (Appendix 10, #24). With regards to this question, Patty stated that after the students finish working, whether independently or in groups, they have to either give feedback to each other or present their work to the rest of the class. She thinks that her learners are constantly communicating because, in one way or other, they have to share their work. As they have to read to solve problems and write in the notebook, Patty expressed that reading and writing is also done in her lessons. She thinks that listening only takes place when they listen to each other during feedback or group work. She emphasized that when she listens to a girl talking in Spanish, she asks her to speak in English. For her, this is a strategy to encourage the students to speak in English and improve their oral skills in this language (Appendix 12, #18). Meanwhile, Glory thinks that as her students are little (six and seven years old), learning vocabulary is closely related to listening and speaking because the girls first have to become familiarized with the vocabulary they have to use, in this case vocabulary related to mathematics. Therefore, she thinks that her students mostly develop listening and speaking skills because they do not produce writing in English, yet (Appendix 11, #26).

Because both language and content teaching is vital in CLIL, the participants were also asked how they teach the math content. Betty mentioned that she normally starts teaching the content by modelling the activity. Then there is what she called a time to “practice doing the activity” (Appendix 10, #26) which can take place in pairs, groups or the whole class. She also said that she starts the lesson with a motivation (warm-up activity) and the problem of the day (i.e., a problem students have to solve during every lesson). Regarding this question, Patty says that using CLIL, the class turns more dynamic because they implement different strategies. She teaches vocabulary, gives explanations of the new content, especially when the students find the task challenging, and has students work in their textbook. According to Patty, the book has explanations, problem solving, definitions, and pictures, which make it a good tool. The learners work on activities in their notebooks, the textbook, or worksheets (Appendix 12, #20). In response to this question, Glory said that she makes her students work with blocks, counters, or candies to solve additions or subtractions. She explained that she models how to solve the task and then gives different exercises to the students so they can solve them (Appendix 11, #30).

The next question, question nine, asked the participants how they verify their students' learning of content. To this question, Betty stated that her assessment allows her to follow-up on the students learning. She said that normally she assesses every day, and she thinks that she can assess not only with a quiz or test, but from the “results of every day” (i.e., everyday student performance in class) (Appendix 10, #28). She mentioned that students always have a product to show and check. This checking can be either with peers or with the whole class. Thus, she can keep track of students’ performance, identify weaknesses, and support students with difficulties using scaffolding. Regarding this aspect, Patty stated that they have part of the lesson called “feedback” at the end of the each class. Sometimes this feedback is as an oral, whole-class activity, an activity in the notebook, or something done on the board. The students have to share their answers with the rest of the class, as peer feedback or in groups; thus, she has the possibility to determine if there was learning (Appendix 12, #26). For Glory, a good learning indicator is motivation; the students’ desire to participate and help others to answer when they have to answer a question. She thinks that when her students want to participate by solving a word problem or doing exercises in the notebook or in the book, they are showing their learning (Appendix 11, #36).

With regards to how students use language to communicate in the class, Betty explained that normally second and third grade students try to speak in English all the time, but sometimes they use a mixture of English and Spanish when they do not how to say something in English. According to her, those moments are good opportunities to help them learn more vocabulary because if they do not know how to say some words in English, the teacher can teach the correct form to say it and provide input to communicate everything in English (Appendix 10, #30). Patty stated that when she walks around to check work or support students, she realizes that the lower-grade students especially try to speak Spanish while they are working in groups, and sometimes they address to her in Spanish because they are speaking Spanish. However, she pretends she does not understand them as a way to remind them that they have to speak in English. When this happens, the students switch and speak in English. Although students try to speak English, she thinks it is difficult for the lower grade students, so, when she is not there, they just speak in Spanish. However, when they have to present their work, they do it in English. She said that she might let them speak in Spanish while they are working in groups, but it is mandatory to speak in English when they present the task to her or to the whole group. If during the presentation they do not know how to say a word in English, they ask for help, and then they repeat the expression in English (Appendix 12, #32, 34 and 36). Conversely, Glory, who has the younger students, mentioned that her students speak in English, and she motivates them to do it almost all the time. She thinks that her main purpose is to help them "get used to the vocabulary and use it, and understand that they can use it" (Appendix 11, #42). She also stated that her students speak in English with each other.

The final questions of the interviews aimed at obtaining the teachers' opinion on CLIL and how useful they find it. For Betty, CLIL is very useful because it helps her be more dynamic in the class. She thinks that the children learn more when the class is divided into stages, and they can learn while doing because the teacher talks less and the students participate more (Appendix 10, #32). Patty says that she not only uses CLIL to teach math but also science. In her opinion CLIL is useful because it helps her manage time and noted that the students are "busy every stage of the class" (Appendix 12, #40). Some could be walking (in a carrousel activity or comparing work with other classmates), others sitting, but they are always working during the class. She thinks it is very useful. Finally, Glory thinks that although she is not very familiar with CLIL, she thinks it is very useful. In her opinion, "CLIL is like reality," possibility meaning that CLIL allows for contextualization as in real life. She also stated that it makes mathematics more "tangible for them for the girls" (Appendix 11, #48).

Teacher interview 2.

The second interview was designed in order to answer questions which came up during the observations (see Appendix 7). There were aspects related to general and academic language support, scaffolding, vocabulary, and use of content that were not seen during the observations; therefore, the researcher decided to design another interview to know how teachers deal with these issues during their lessons.

The first three questions of the interview aimed to find out information about how teachers deal with grammar and vocabulary when students have to solve word problems. Betty said that she breaks down the problem and explains it step by step (scaffolding); when there is misunderstanding due to lack of vocabulary, she reads the problem again and supports the students by explaining the meaning of the words or they use the glossary, so they can understand the meaning of the words. As Betty also teaches language arts, sometimes she makes projects with math in order to emphasize the grammar that the students are learning in their other class. She also uses clue words which the students write in a vocabulary notebook. She mentioned the importance of explaining grammar and the structure of the problem especially to guide the students when they have to write their own problems (Appendix 13, #4, #6, #8 and, #10).

Similar to Betty, Patty also thinks that grammar is important because they are not only learning to solve word problems, but they are learning English within the class of math. For her, to write a word problem for instance, the students need to know about the structure of a sentence, how to write a paragraph, and what they really want to know in order to make sure they are asking the right question. Regarding vocabulary, she explained that for subject vocabulary, the students use the glossary at the end of the book to know the meaning of the new words. In terms of general vocabulary (vocabulary that cannot be found in the glossary), the students use the dictionary. However, Patty described that sometimes she asks students to support each other by asking a classmate to explain the meaning of an unknown word to her (but in front of the rest of the class), and then students help those who do not know the meaning of the unknown word. She also explained that students use context clues to guess meaning. Patty mentioned that sometimes she has to stop the lesson to explain some grammar, especially related to structure, when the students are asked to create their own problems. She says that the learners need support to write accurate questions. She supports agreement of the question with the rest of the information in the word problem, structure of the question, and style of the problem in general. She provides input and vocabulary such as the use of "wh- words" (what, where, when…), and she models how to write a problem step by step (Appendix 15, #4, #6, #8, #10 and #12).

Regarding this question, Glory did not mention that she teaches grammar explicitly during her math lessons. Basically, she helps students understand vocabulary either by drawing pictures or by explaining the meaning of the unknown words. She says that she frequently stops during the class to check understanding or to teach vocabulary (Appendix 14, #4, #6, and #8).

Question four aims at matching the content required in the curriculum and the teaching of that content. The teachers were asked to speak about how they teach students to develop some functional language skills, such as description of shapes, required in the curriculum as one of the learning objectives. With respect to this, Betty explained that she develops practical activities which she models first and then the students start producing their own work. She claimed “if you model how they have to write a statement, if you model them, it is easier for them to do it, so it’s like helping them doing the structure of the statement” (Appendix 13, #12). She uses modeling as a scaffolding tool. To this question, Patty told the researcher that she uses questions as input to help the students think deeply about the object that the students have to describe. While describing a triangle, for instance, she asks the students what the shape is, and then asks about what else they can say about the shape in order to foster students’ thinking about the properties of the given shape. She also implements the strategy of asking wrong questions such as “is it a quadrilateral?” (Appendix 15, #14); thus, the students should have enough information to speak about the topic. Regarding Glory, she mentioned that “the first step for description is observation” (Appendix 14, #10), so she asks sensorial questions to the students such as what they see, what they feel, and she gives them clue words to help them describe size or shape. Although not clearly stated, it seems that the students use manipulatives in order to do these sorts of tasks.

The fifth question aims at discovering how students carry out challenging tasks proposed in the curriculum, such as writing their own word problems and what language support teachers give to the students during these type of activities. Betty mentioned that she encourages her students to write their own word problems. She explained that as it is a challenging task for the kids, consequently she has to support her students by modelling on the board how to write a word problem. She told the researcher that the first time she taught how to write word problems to the students, she started collecting the students' ideas in a brainstorm, and then she wrote all of the students' thoughts on the board. After that, she started giving shape to the problem and helping the students realize the structure of the problem. At the end, the problem was written on the board as a model for the learners. After that stage, the teacher asked the students to write their own problems. Betty declared that students mostly take the same ideas from the model and change some information, so it is basically the same structure. She also said that students find it easier to write addition problems than subtraction problems (Appendix 13, #14). In response to this question, Patty stated that her students have to create their own word problems. Similar to Betty, Patty also models word problems for the students. She commented that her students usually frame their problems on the structure of the model given by the teacher. They just change the subject of the problem and the amounts, but it is essentially the same problem. Patty recognized that her students prefer to write addition and multiplication problems rather than subtraction or division; thus, she has to encourage them to write subtraction and division problems (Appendix 15, #16). Glory, on the other hand, explained that her students do not write word problems yet. She is modeling how to do it, and they are attempting to write their own through drawings (they draw pictures to create their problems); however, they have not accomplished the task of using words to write a problem yet. Her goal is to continue helping them by starting writing simple word problems until they can create their own (Appendix 14, #12).

The last question was intended to identify the relevance of language in the assessment of the students. The teachers were asked if they also evaluate language use and grammar when evaluating word problems. Betty told to the researcher that she actually evaluates the structure of the problem, the words the students use in the problem (probably she means subject vocabulary), and if the questions they use are appropriate for an addition or for a subtraction problem (Appendix 13, #16). Regarding this question, Patty mentioned that she checks “spelling, grammar, and the structure” (Appendix 15, #18). However, she explained that if the problem makes sense, regardless structure mistakes, she assesses it as a good problem. In that case, she talks to the students and gives feedback in terms of how to improve grammar or structure, according to the situation. As Glory students do not write word problems yet, the interviewer omitted the question six in Glory’s interview.

Results from Observations

Another source of information for this study was class observations. In order to have a general view on how lessons are developed, math lessons from first to sixth grade were observed twice. At this point, Betty was observed four times (two times in second grade and two times in third grade); Patty was observed six times (two times in fourth grade, two times in fifth grade, and two times in sixth grade), and Glory was observed two times in first grade.

The following section is a description of relevant information obtained from the observations. It contains mostly aspects related to the methodology implemented in the classroom, how the content is being taught, and how academic and general language are being approached in the math lessons at GLC. There is also a report of the main CLIL aspects observed in each grade based on the information gathered from the two observations in the template and rubrics designed for this purpose. (See appendices 4 and 5)

First grade: **Observation one.**

The first observation took place on September 24, 2015 from 10:45 to 11:35 am in the first grade classroom. The desks were distributed around the classroom in groups of three girls per group. Each group was made up of three desks and three chairs organized in a circular shape. The teacher's desk was placed in a corner of the classroom. There were notebooks numbered on top of the teacher's desk. The students were ready for the class with their pencil cases on the desks and waiting for the teacher's instructions.

Glory asked the students to sit, making a circle on the floor. Immediately, the students followed her instruction. Then, she showed flashcards with additions to the students. She chose students one by one and asked each girl to solve a problem of addition. One of the learners answered in Spanish and the teacher asked her to respond in English. It is important to note that the teacher always talked to the students in English. The teacher asked another student to solve another addition problem, but the student seemed to not know the solution, so the teacher asked another student to help the girl. Meanwhile, some students counted with their fingers to solve the problem. The teacher continued asking other students to help until they finally found out the answer. It seemed that the students were used to doing this routine in their math lessons. They were eager to participate and hoping to be chosen to solve sums.

After finishing the activity with the flashcards, the teacher gave the math notebooks to the students. The students found worksheets with one-digit addition problems already pasted in the notebook. As soon as all the students had received their notebooks, Glory started explaining and modeling how to solve the problems. She used the strategy of counting with the fingers to scaffold because most of the girls found difficult to solve the additions mentally. Then the students started reading the addition sentence (4+3= 7) in the notebook and the sum of the problem that the teacher was modeling. After the explanation, the students started working in their notebooks independently.

One girl complained because she thought there were no numbers in the problem that she was solving. However, a classmate approached to her and showed her where the numbers were. The interaction between the students was mostly in Spanish; however, the students were able to read the addition sentences in English. The teacher walked around the classroom supporting those students who needed help. Most of the students solved the problems quickly and independently. The teacher checked each student's work as they finished the task.

For the next activity, Glory wrote addition problems on the board and asked the girls to write them and solve them in the notebook. The teacher gave counters (little blocks used for counting) to two students who found difficult to solve the additions mentally or with their fingers. When students finished the task, Glory asked them to sit on the floor and play with some addition cards. They started talking to each other in Spanish, but they did not use the cards to review additions. Therefore, the teacher gave some cards to each girl and asked them to work in groups of two or three to practice additions. Then the students started playing with the addition cards by challenging each other. Most of them asked in Spanish but gave the solution of the additions in English. The students sang a rhyme in English ("we got it, we got it") when they answered properly. The learners were excited by the activity. However, a small group of four students who required more support did not have time to work with the flashcards.

First grade: Observation two.

The second observation took place on October 15, 2015 from 10:45 to 11:35 am, again in the first grade classroom. The classroom was organized the same way as in the first observation: the desks and chairs were organized in a circular shape, the teacher's desk placed in the same corner of the classroom, but this time there were no notebooks on top of the teacher's desk. There was a pile of math books and notebooks on top of the bookshelf. The students were finishing an activity from the previous lesson; therefore, they took longer to organize for the math lesson.

The teacher asked the students to prepare for the math lesson and started counting until all the girls were ready. The students continued counting until everybody was ready. Then, the students picked up their books and pencil cases and sat on the floor. The teacher told them that they would check the homework. Some students tried to translate what the teacher said in Spanish to the rest of the class in order to demonstrate understanding.

Next, Glory started checking the homework (the homework was about word problems with additions and subtractions). She read each problem and the students raised their hands to show that they knew the answer. The teacher chose a student, but she did not know the answer; thus, the teacher asked a classmate to help her. The second girl gave the correct answer. All the students reviewed their own answers to confirm that they had the same answer. During this homework review, all the students were excited to participate by saying their answers. The students that were not chosen complained because they all wanted to give their answer for each problem. In one occasion a student answered in Spanish, but the teacher asked her to answer in English, and the student did. During this activity, the students' answers were all numbers. The students neither explained the process they followed nor gave reasons to explain why they chose the operation that they used.

After checking the homework, the teacher asked the students to read some subtraction sentences out loud. Then the teacher asked the students to go to the next page and solve a problem on that page. It seemed that the students found the problem easy to solve. The teacher explained the problem step by step and asked the students to follow her by drawing to show the quantities in the problem and then, she asked them to write a subtraction sentence and solve it according to the context of the problem. One student did not understand what she had to do, so the teacher explained to her individually, guiding her to solve the problem by identifying clue words. Then the teacher asked the student to draw a picture to show the information; and after that, she asked her to write the subtraction sentence. The teacher emphasized the drawings as a strategy to help solve problems. After all the students finished solving the problem, the teacher checked the students' work one by one. During these activities, the students asked or addressed the teacher and classmates in Spanish all the time, but the teacher answered all their questions in English. It seemed that the students understood these activities which were carried out in English by doing what the teacher told them to do.

As soon as the students finished their tasks, they went to the shelf and took some materials, without any instructions from the teacher (it seemed that the teacher has some routines for the students). Then, they sat in groups of three and four and started to play with addition cards, subtraction cards, operation dice, and erasable posters on which they could solve additions or work on counting. The students enjoyed working together and answering the operations. Then the teacher went to each group and started supporting the group that was working with the dice since they found the activity very difficult.

During this task, the teacher was constantly asking the students to speak in English; consequently, the students started reading the operations in English. Glory continued monitoring each group's work. While working in the different groups, the students made agreements in order to assign turn taking during the activity (who started and who continued in each round), but still in Spanish. Five minutes before the class was over, the teacher asked the students to pick up the materials, place them on the shelf, and sit together in a circle.

As a wrap-up for the class, the teacher asked the students to close their eyes and think about what they did that day. Some students said that they went to the park. Thus, the teacher explained that she meant what they had done in the class of math. Then the students opened their eyes and answered in Spanish "restas" and "sumas". As students answered in Spanish, the teacher asked them to say in English and she modeled how to do it "addition" and "subtraction." The teacher asked if they had liked working in groups; unanimously the students answered "yes!"

CLIL aspects observed in first grade.

From the template (see appendices 16 and 17), the following aspects related to CLIL were observed:

- The content objective was implicit; it was inferred throughout the development of the lessons. (solving addition and subtraction problems)

- There was no evidence of a language objective at all. Glory gave some language support for the students during the lessons.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course.
- There was no evidence of an introduction of subject vocabulary during the class. Probably it was introduced in another lesson because the students were familiar with the numbers and the names of the signs: plus (+), minus (-) and equals (=). The teacher encouraged the students to use these words when reading the addition and subtraction sentences.
- There was a review of key vocabulary at the end of the second observation. In the first class, there was emphasis on key vocabulary during the lesson.
- Glory clearly and intentionally explained the content through different activities in both lessons.
- There was little connection between the problems solved in the class with the students' context. The problems were mostly taken from the book. The students found some relation with their reality when they were using the counters, when playing with the cards, and when working in groups with the different resources.
- The teacher used scaffolding strategies such as counting with the fingers and using drawings to help the students solve additions. The teacher gave individual support to the students who found difficult to solve the problems.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas.

- The students interacted while playing with the addition cards, while checking homework and when working in groups; however, most of the interaction between students was in Spanish.
- The students had plenty of time to think and respond to input and accurate material and resources for the age, level, and learning objectives.
- The students had frequent opportunities to use math language while reading addition sentences, while working with the problems, when playing with the addition cards, and when working in groups.
- The students had frequent opportunities to demonstrate content knowledge while solving addition problems, when playing with the addition cards, and when working in groups.
- Only two language skills were emphasized during the classes. The students were mostly reading and speaking in response to the teacher's input. There was some writing when writing addition and subtraction sentences. The listening took place during the interaction with the teacher who always spoke in English to the students.
- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.
- There was evidence of feedback when checking homework. The teacher checked classwork in the notebook.
- In the first observation there was no consolidation of learning. The class ended when the students were playing alone with the cards because the teacher was working with the students with difficulties. At the end of the second class, there

was a wrap-up session in which the teacher asked the students about what they had learned during the lesson.

- Some activities during the lessons were good opportunities for assessment.

Second grade: Observation one.

This observation took place on September 22, 2015, in the second grade classroom at 8:35 am. The desks were organized in rows and each student was separated from each other. The teacher's desk was placed in a corner, next to the whiteboard. All the students were ready for the class, with their books, notebooks and pencil cases on the desks.

Betty started the lesson checking student's prior knowledge about place value. She wrote two-digit numbers on the board and asked the students to determine the place value of each digit in the number, and then she wrote another example with a three-digit number to identify the number in the hundreds place. The teacher drew diagrams on the board to introduce the new content: place value "hundreds, tens, and ones." Then the students drew diagrams to show hundreds, tens, and ones.

The teacher wrote a number on the board and asked the students to write the numbers in different forms. One student said that she could write the number in expanded form. (524: 500+ 20+4). Another student wrote the number in words (five hundred twenty-four). Then, the teacher wrote three numbers more and chose three different girls to write the numbers in expanded form. Two of the girls found the task difficult to do because in one of the numbers there was a zero in the tens place in the numbers (301) and in the other, the zero was in the ones place (230). The teacher asked the rest of the class to evaluate their partners' work by saying "agree" or "disagree." Because there were mistakes in the expanded form of 301 and 230, some girls said “disagree.” The teacher asked why they disagreed and one girl passed to the board and wrote the correct form. Then the teacher explained that they also had to add the zero—(300+0+1) (200+30+0).

After the explanation, the teacher asked the girls to remember the concept of subtraction. One student mentioned that it was taking away. The teacher praised the student’s answer. Later, the teacher wrote a word problem on the board. “Lincoln school has 654 students, and Roosevelt school has 256 students fewer than Lincoln school. How many students are at Roosevelt school?” The students read the problem out loud. Then the teacher asked “Who knows what is fewer?” the students answered in Spanish. The teacher gave a synonym “like less.” The teacher emphasized the word “few” (not many) and explained that fewer came from few. Then, the teacher asked the students to solve the problem together. She started explaining what to do step-by-step. Not all of the girls followed the problem. Some girls were reading in the book and others were drawing.

After solving the problem, the teacher gave a worksheet with problems to the students, and they started solving the problems independently. The teacher supported the students who required help. The students addressed to the teacher in Spanish, but the teacher’s support was always in English. As soon as the students finished the task, the teacher checked their work by choosing volunteers to share their answers. The teacher asked the students to explain the steps they followed to solve the problem. Some students tried to explain how they solved the problem in English: they mostly mentioned the numbers in the problem and the operation and others combined Spanish and English. The teacher gave each student plenty of time to think and explain how they solved the problem. The students were motivated during the activity, and all of them wanted to go to the board to show their work.

Second grade: Observation two.

The second observation took place on November 3, 2015 in the classroom at 8:35 am. As in the first observation, the desks were organized in rows and each student was separated from each other. The teacher's desk was placed in the same corner, next to the whiteboard. All the students were ready for the class, with their books, notebooks, and pencil cases on the desks.

The students started asking the teacher to check the homework and the teacher told them that she would collect it at the end of the class. Then, the teacher showed two figures made of paper: a triangle and a rectangle. Then the teacher asked if the first figure had three sides or four sides. The students answered that the figure had three sides (it was the triangle). Later, the teacher asked which figure had six sides; the students answered that neither. The teacher asked the students to tell her the name of a figure with six sides. The students replied "hexagon."

The teacher explained to the students that they would learn about angles; therefore, she wrote the word "angles" on the board. The students asked if they had to write the title in the math notebook. The teacher told them that they would write it later; first, they had to pay attention. Betty drew a triangle on the board and asked the students what it was. The students answered that it was a triangle, and then the teacher asked them to look at the corners. One student asked what a corner was and a classmate told what she thought in Spanish "las punticas." So, the teacher asked the students to remember from last class what they call the object when two lines join together. The students answered in chorus: "vertices." Then the teacher explained that the distance between two sides in the triangle are called angles. She showed the vertices and sides in the triangle and drew the angles. After that, the teacher showed models of angles and asked the students if they could see the angles. All the students replied "yes." A student asked "Por eso el título es angles?" and Betty confirmed by nodding. Immediately, the teacher wrote the definition of angles on the board, and the students wrote the definition and made the drawing in their notebooks.

When the students finished writing, the teacher took the paper triangle and asked the students to count how many angles were in the triangle. And the students answered that they saw three angles. The teacher drew a diagram of a square and marked the angles. Automatically the students responded that there were four angles in the square (the teacher had not asked about the angles in the square). Happily, the teacher answered that they were right.

The teacher asked the students to work independently in their books (pages 522 and 523). They had to circle the angles in the shapes and write the number of angles. To confirm understanding, the teacher asked a student to repeat the instructions. The student answered in English with difficulty, so the teacher asked another student to repeat what the first student had said and the student repeated again. Another student asked the teacher (in English) if they had to do something else. As the teachers showed the model on the board using red markers, the students asked if they had to do the task with red pencil. The teacher recommended using a black pencil in case they had to erase.

The students worked independently in the book. They identified angles and wrote the number of angles in each shape. Some students finished the task faster than the others. The teacher checked work individually. Some students started asking for support in the last part of the activity; they asked what to do in Spanish, but the teacher gave the instructions in English. The students seemed to understand. As more students were finishing the activity, they started to line up by the teacher's desk in order to show her their work, and the teacher continued checking each one's work.

One student could not understand one part of the task (problem 11) in which they had to follow instructions to draw a shape. The teacher explained in English, but the student seemed not to understand, so the teacher explained the activity in Spanish. Other students also had the same difficulty. The problem became a recurrent question to the teacher. She continued explaining individually, sometimes in English, but others in Spanish. As many students continued asking, the teacher asked the students to sit down and read the problem together. The teacher started to break the problem down. She emphasized clue information: "two shapes that together make seven angles in all." The teacher asked the students "How many shapes?" The students replied "two"; then the teacher asked "how many angles in all?" The teacher emphasized the expression "in all." The teacher drew a rectangle and a triangle on the board and asked how many angles were in each shape. The students replied "four and three." Thus, the teacher asked how many angles were in all. The students answered "seven."

The teacher started solving a problem where the students had to draw three shapes that together made eleven angles. She asked clue questions such as "how many shapes?" The students answered “three.” Then, she asked “How many angles?” and their response was “eleven.” A student drew two squares and 1 triangle. She counted together the number of angles in all the three shapes and they were eleven. One girl said that it was wrong, but then she discovered she had made a mistake because in the question about how many shapes, she had answered that she had to draw two shapes; therefore, her answer was wrong.

The teacher checked the next problem (problem 13); the students had to draw a shape with five angles. They all drew a pentagon. In order to wrap up the lesson, the teacher asked about the number of angles in a rectangle, in a quadrilateral, in a triangle, in a pentagon, and how many sides are in a hexagon. The teacher chose students randomly (there was a tin with the names of the students written on sticks) to answer the questions. All the students chosen answered correctly. The teacher declared that the class had ended, so the students closed their books notebook and went to recess. The class ended at 9:25 am.

CLIL aspects observed in second grade.

From the template (see appendices 18 and 19), the following aspects related to CLIL were observed:

- The content objective was implicit; it was inferred throughout the development of the lessons (learning about place value and angles).
- There was no evidence of language objective at all. Betty gave some language support for the students during the lessons.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course. The teacher checked prior knowledge in order to associate prior knowledge to new content.

- There was emphasis in subject vocabulary during the classes. The teacher helped the students to learn subject vocabulary at the beginning of the lessons (concept of angle, definition of fewer).
- There was review of key vocabulary during the classes observed (words such as angles, fewer, sides, and extended form were used often during the lessons).
- Betty clearly and intentionally explained the content through different activities (drawing a shape and showing the angles in it, modeling solving problem, monitoring individual work).
- There was little connection between the problems solved in the lessons with the students' context. The problems were mostly taken from the book and worksheets. Only in the second lesson observed, was there an attempt to connect the content with real life when one student discovered the title of the lesson "Por eso el título es angles?" and when trying to define the concept of angles "las punticas."
- The teacher used scaffolding strategies such as explaining problems step by step, modeling, drawing of shapes to identify angles, explanation in Spanish, and individual support to the students with difficulties to solve the problems.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas. The interaction was mostly teacher to student.
- There were few student to student interactions; these were only when giving peer feedback while checking tasks or homework. Students mostly interact between them in Spanish. There was no evidence of teamwork.

- The students had plenty of time to think and respond to input and accurate material and resources for the age, level, and learning objectives.
- The students had frequent opportunities to use math language while working with the problems, when giving feedback, and when checking classwork.
- The students had frequent opportunities to demonstrate content knowledge while working with the problems, when giving feedback and when checking classwork.
- Only two language skills were evident during the classes. The students were mostly reading and speaking in response to the teacher's input. There was some writing in the second lesson observed. Listening took place during the teacher-student interaction.
- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.
- There was evidence of feedback, mostly peer feedback (students giving feedback to their classmates). The teacher supported students' feedback by confirming or encouraging the students to find mistakes.
- In the first observation, there was no consolidation of learning. In the second observation, Betty made a wrap-up activity. She asked about the number of angles in a rectangle, in a quadrilateral, in a triangle, in a pentagon and how many sides are in a hexagon. Students answered correctly.
- Some activities during the lessons were good opportunities for assessment.

Third grade: Observation one.

This observation was carried out on September 29, 2015 from 9:55 to 10:45 am. The students were arranged in pairs and the desks formed two rows of six students and one of four; all with spaces between pair and pair. The teacher's desk was placed next to the whiteboard. The students had their math books, notebooks, and pencil cases on top of their desks. The teacher was speaking in Spanish to the students, but when the researcher entered in the classroom, she switched to English.

Betty started the lesson telling the students that they would work on the chapter review about addition, subtraction, rounding to the nearest 10 and 100, and solving word problems in the book (pages 55 and 56). Before working in the book, the teacher wrote a model subtraction problem on the board and asked the students to help her explain the steps to follow to solve subtractions using the strategy of regrouping. The students tried to follow the steps. They retold a story about how numbers went to their neighbor number to lend some numbers and then subtract. The students and the teacher solved the subtraction problem together.

The teacher told the students to solve the operations and problems in the pages 55 and 56, but she did not verify if the students understood what they had to do or in what pages they would work. The students started working independently. The first part of the review checked vocabulary and properties of addition and subtraction; some girls found this part difficult and asked other classmates (in Spanish) to explain what to do. The second part of the review was solving operations (three digit additions and subtractions). Most of the students could deal with these operations easily. When all the girls were working on this part of the review, the classroom was totally quiet; they were all concentrating on their work. The last part of the review was word-problem solving. The students found this part of the review very difficult. Many asked the teacher for help. When they talked to their teacher in this part of the class, the students used mostly Spanish with some words or expressions in English, but the teacher always answered in English. She walked around the classroom in order to review the students' work and also supported students with difficulties.

A girl was confused about subtracting 2 – 0 (the student thought it was 0 - 2); but the teacher explained the difference using markers. As several students had asked about how to subtract 2 from 0, the teacher took the opportunity to explain both cases to all the class. The teacher focused the lesson mainly on reviewing how to solve subtractions by regrouping. And the students only interacted with the teacher and the book. Several times during the class, the teacher asked for the groups' attention in order to give general hints about how to solve certain problems. For instance, she modeled a problem to help the students make connections with problems similar to those in the review "you ate 2 chocolates yesterday and 3 today, how many chocolates did you eat during the two days?" She also reviewed place value to explain regrouping. In addition, she told the students that they could use other strategies such as rounding to the nearest ten and hundred to estimate additions and subtractions. The students completed the review. As the class had ended, the teacher returned some quizzes that the students had taken the class before. Many girls got low grades in the returned quiz (addition and subtraction using regrouping). There was no feedback session on the quiz.

Third grade: Observation two.

The second observation of this group took place on October 15, 2015 from 8:25 to 9:25 am. As in the first observation, the class was arranged in pairs of desks forming three rows: two of six and one of four students separated from pair to pair. The teacher's desk was in the same place, next to the whiteboard. This time the class had already started, but the girls were still organizing themselves for the lesson. Many were looking for their books and notebooks and others still had the books and notebooks from the previous lesson on their desks

The teacher asked the students to number from 1 to 3 and sit together to make groups (two groups of five and one of six). As the groups were organized, the students started to speak among themselves in Spanish. The teacher told the groups to work on pages 109 and 110 in the book (it was a checkpoint activity). It seemed that the class continued from content worked the day before. The students asked the teacher, in Spanish, what they had to do. The teacher answered in English that they had to work together on pages 109 and 110. She did not stipulate the time to complete the task. As the students started looking at the activities, they asked (in Spanish) if they could look back in the book and notebook to find information to solve the tasks. The teacher accepted this strategy.

The teacher went group by group answering questions and supporting each group's work. The students sometimes asked for help in English and responded to the explanations from the teacher in English, but as soon as the teacher left, they continued speaking in Spanish. In the groups, the students supported each other in order to carry out the tasks. Some translated the teacher's explanation to Spanish. Actually, all the conversation among the students was in Spanish.

The learners were motivated to solve the exercises in the book and seemed to be concentrated on their work. The teacher gave strategies to multiply to each group. She told to one of the groups that multiplying 3x4 was "like adding 3+3+3+3+3." Another group did not know how to write a multiplication sentence based on a diagram. She asked the students to identify how many groups there were and how many objects were in each group; then, she asked them how to write it is as a multiplication. The students answered correctly.

Betty also helped the groups break down information from the problems to identify relevant information to solve the problem. And after identifying hints from the problems, the students were able to understand what to do. Betty also suggested that the students draw in order to have visual support to solve the problem. The students read the problems in English, but they translated the information into Spanish. They also discussed possible strategies to solve the problems (one group was deciding if they had to add; they also concluded that if they added, probably the solution would be greater than the possible answers given in the book).

The teacher started collecting the work of the students who finished. Then the teacher assigned homework (page 112). The students who finished first started working on the homework while the rest continued working on their classwork. Suddenly, the teacher asked about a student who did not come to school. A student answered in Spanish "está enferma." The teacher told her the way to answer in English "she is sick." The student repeated in English "she is sick." As all the groups had finished the task, the teacher asked the students to come back to their places, and the students did. Then she started explaining the homework. The students had to look for multiplication places and they also had to write multiplication sentences. The students said that the homework was easy. The teacher told the students that they had to learn the multiplication tables 1, 2 and 3 for the next week.

In order to wrap up the lesson, the teacher reviewed some main aspects about multiplication. “3x3 is how many groups of what?” The students answered “3 groups of 3.” So the teacher asked in which other form they might say that, and the students answered that it was “the same a 3+3+3.” The bell rang and the students went to recess.

CLIL aspects observed in third grade.

From the template (see appendices 20 and 21), it was observed the following aspects:

- The content objective was implicit; it was inferred throughout the development of the lessons.
- There was no evidence of language objective at all in any of the lessons.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course.
- There was little evidence of an emphasis in subject vocabulary during the classes. Observed was a review of key vocabulary at the beginning of the first class and an attempt to review key vocabulary at the end of the second class.
- Betty explained the content through different activities through a chapter review and a checkpoint activity.
- There was little connection between the problems solved in the class with the students’ context. The problems were mostly taken from the book. The students found some relation with their reality when the teacher gave the following

example in the first lesson “You ate 2 chocolates yesterday and 3 today, how many chocolates did you eat during the two days?”

- The teacher used scaffolding strategies such as allowing the students to look back in the book and notebook to find information to solve the tasks, giving strategies to multiply. This was seen when she told to one of the groups that multiplying 3x4 was “like adding 3+3+3+3+3.” helping the students to break down information from the problems to identify relevant information to solve it, modeling, and rounding to the nearest ten, and using drawings to have visual support to solve the problem.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas.
- In the first class there was interaction between the students, the teacher, and the book. In the second lesson there was teamwork. However, the students mostly communicated in Spanish
- The students had plenty of time to think and respond to input and accurate material and resources for the age, level, and learning objectives.
- In both lessons, there was no evidence of an intentional task in which the students had to show language knowledge, neither academic nor general language. They only used math language when asking questions to the teacher.
- The students had frequent opportunities to demonstrate content knowledge while solving the activities in the book.
- Only two language skills were evident during the classes. The students were mostly reading and speaking in response to the teacher’s input. There was some

kind of writing in solving some problems in the second observation. Listening took place during the interaction teacher/students and somehow in the interaction student/student.

- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.
- There was little evidence of feedback when checking homework. The teacher did not check classwork in the second lesson observed.
- In the first observation there was no consolidation of learning. At the end of the second observation, there was an attempt at a wrap-up session in which the teacher clarified the concept of multiplication.
- All the activities in both lessons were summative assessment (evaluation of all the content taught during a period of time in order to obtain a quantitative report).

Fourth grade: **Observation one.**

The first observation was held on September 30, 2015 from 10:45 to 11:35. The desks were arranged in rows of seven pairs. One student was by the teacher's desk. The teacher's desk was near the window and at certain distance from the whiteboard. All the desks were facing the board.

After Patty's greeting, the students reminded the teacher that there was homework. The teacher asked a student to collect the homework. The teacher placed the homework on top of her desk, but did not give any feedback.

The teacher asked the students who knew how to add. All the girls raised their hands except for two. Then Patty started checking vocabulary about addition. The teacher asked for the name of the solution of an addition problem. One student said “product;” another student corrected this student by saying “that is for multiplication.” Because the students could not remember, the teacher finally told them that it was called sum. Immediately, the teacher wrote a five-digit addition problem on the board and started asking for the parts. The students answered in chorus “first addend,” “second addend,” “plus.” The students responded in English to the teacher’s input. The teacher also reviewed place value by asking the students to identify the place value of the specific digits in the addends of the problem. The next step in the lesson was seeing whether the students remembered the strategy of regrouping. The teacher modeled the strategy. She asked the students to help her solve the problem step-by-step. The students guided the teacher by saying what to do. She emphasized the expression “carry one;” and later the teacher did the same with a six-digit addition problem, but this time she chose a single student to answer. The student was solving the addition, and at the same time, she was explaining what she was doing step by step. After solving the addition, the teacher asked the students to identify the place value of each digit in the sum. All the students were engaged and wanted to participate. Then, she asked the students to read the sum at the same time “969,063.” In order to complete this part, the teacher asked the students to write the number in word form and expanded form (the teacher asked a student to write the first part, and then chose other girls to continue until they wrote the number in the two forms required). When writing the number in expanded form, there was a moment in which the students discussed whether they had to add a zero or not in the hundred place but finally they concluded the answer on their own.

Patty asked the students to work on page 28, in a section named “check, share, and show.” Because the students could not find the task, the teacher interrupted the lesson and started reviewing prepositions (above, below, down) in order to help students find the location of the task. In order to solve the task, the students had to use a place value chart. The instruction required the students to place the digits on the grid. Since the students did not know what a grid was, the teacher explained the meaning of the word and gave instructions on how to do the activity which required the students had to solve some additions and write the sum in the place value chart. The teacher clarified questions and asked why squares were used in this task. The students answered that they had to order according to place value; the teacher explained that it was to align the numbers. A student gave a model on why it was important to align numbers (“Because we can read the numbers properly”).

The teacher verified that the instruction was clear by asking different girls about what they had to do. However one student still asked her classmates what to do. Then the students worked individually. The teacher gave the students five minutes to solve six operations. While the students were solving the task, the teacher monitored the students’ work. The students compared their answers when they finished the activity. They interacted in Spanish among themselves. The teacher asked the students to discuss why they had different answers. After identifying mistakes, students stared changing their answers. The teacher gave plenty of time for the students to compare answers.

In order to check work, the teacher chose a student randomly. The chosen student had to say and write the answer on the board and the rest of the students either agreed or disagreed with their classmate. The students also checked in the notebook using a different color for corrections. All the students were eager to participate. The student in isolation did not participate with the same enthusiasm as the rest of the students.

Fourth grade: Observation two.

The second observation took place on October 30, 2015 from 9:55 to 10:45. In this opportunity, the classroom was divided in five groups of three students. The teacher's desk remained in the place near the window and apart from the board.

It was a class of geometry; it started fifteen minutes late because there was a birthday party at recess, and it took longer than expected. Patty asked a student to collect the homework which was a multiple choice worksheet in the book about symmetry. While the helper collected the homework, the teacher wrote the problem of the day on the board. The problem was: Draw a square in a dotted paper and then fold it to find out how many lines of symmetry are in the square. The teacher asked the students to read and then think about the solution of the problem. After reading, the students had to write the problem in their notebook. The teacher asked a student to read the problem for all the class; as some students were talking, the student asked her classmates to listen. The teacher made sure students knew what a line of symmetry was. The students defined line of symmetry as "an imaginary line that divides a shape into two equal parts." The students worked on the problem.

In a metallic tin, the teacher had sticks with the names of the students written on them. Randomly, the teacher picked a stick with the name of the student who would solve the problem. The chosen student passed to the board and explained how she solved the problem (she said she drew the square and folded the page, thus she found four lines of symmetry). In order to test the student's answer, the teacher asked the girl to fold the paper. The rest of the class agreed with the girl's answer. They all cried out "four lines."

Patty told the students that they would use square dot paper. The teacher drew a square with her finger in the air and a dot to help the students remember the name of the paper. Then the teacher asked the students to open the book in the page 403. The students had to find lines of symmetry in polygons. In order to verify vocabulary, the teacher asked what a polygon was. The students started giving examples of polygons, but they did not give a definition. The students tried to give definitions by mentioning properties of polygons, such as number of sides and saying that they are closed figures. Then the teacher asked what a polygon was. She asked if a circle was a polygon. The students explained that it was not a polygon because it did not have line segments. Finally the students gave the definition with the teacher's support: "A polygon is a flat, closed shape with line segments that join."

Patty gave the square dot paper to the students and told them to read carefully and follow the instructions step by step. One student read the first step to the rest (draw a quadrilateral in the square dot paper), another continued reading (fold the paper to find and draw the lines of symmetry in the shape), and another finished reading the last instruction (measure to verify that both figures have the same length). The teacher emphasized that after drawing the line of symmetry, both sides must have equal lengths. The book had an example for the students.

The students started working independently. They had to decide the size of the polygon they would draw. The teacher monitored the students' work and gave support to those students who required it. Some students were not sure about the size of the figure they had to draw. The teacher modeled the number of spaces needed to have shapes with regular measures. One student was confused about one of the steps, so the teacher asked a student to retell what they had to do, but the student still did not understand. The students complained about the task; nevertheless, another student was able to help them.

The students tried to find the number of lines of symmetry in a triangle. The students folded the paper to find out the lines of symmetry. Some girls said that it was not possible to find the line(s) of symmetry. Some girls found three, others two. One girl showed and explained her work to the rest of the class. She started speaking in Spanish, but the teacher encouraged her to speak in English. Then, the student explained in English. She drew an equilateral triangle and found three lines of symmetry.

The teacher drew the triangle on the board in order to show the students how the triangle looked. She explained that it was possible because the triangle had the same measure in all of the three sides. Then the teacher asked the students to tell her the name of that type of triangle. The students started remembering the name of all the triangles they knew (scalene, acute, obtuse, isosceles right), but they could not remember that this was an equilateral triangle. The teacher started reviewing the properties of each type of triangle (the isosceles has two equal sides and one different; the scalene has a different measure in each side, but how do you call the triangle which has the same measure in all the sides?). The teacher finally said "equi…" The students cried out equilateral!

The teacher gave other shapes and asked the students to complete a chart with the number of lines of symmetry for each figure, including a hexagon. They drew them and found the lines of symmetry. Many students made mistakes (the teacher did not mention it was a regular hexagon) other students did not remember what a hexagon was; thus the teacher supported the students by reminding them about the number of sides in a hexagon. As a result, the students answered that there were six lines of symmetry. The teacher modeled the figure on the board and showed the number lines of symmetry. Some of the students explained the strategy they used to solve the problem. Some mentioned that they counted the number of sides; one student said that she counted the number of "cositas," referring to corners.

A student asked "how do you say 'Ya sonó la campana?'" The rest of the students tried to help saying "the bell ringed." The teacher told them the correct form to say "The bell has already rung." Since the class was over, there was no time to wrap up.

CLIL aspects observed in fourth grade.

From the template (see appendices 22 and 23), the following aspects were observed:

- The content objective was implicit; it was inferred throughout the development of the lessons.
- There was no evidence of a language objective at all. Patty gave language support for the students during the lessons, but there was not an evident language objective in any of the lessons observed.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course in both lessons.
- There was evidence of an emphasis in subject vocabulary during the classes.
- There was review of key vocabulary during the lessons.

- Patty clearly and intentionally explained the content through different activities and according to the students' need during the development of the lessons.
- There was little connection between the problems solved in the class with the students' context. The problems were mostly taken from the book.
- Patty used scaffolding strategies such as modeling and explanation step by step, some language support when required, and individual support to those students who required follow-up.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas.
- The students mostly interacted when giving feedback to classmates or when sharing their work with the rest of the class. There was no teamwork at any of the lessons observed.
- The students had plenty of time to think and respond to input.
- Materials and resources are accurate for the age, level and learning objectives.
- The students had frequent opportunities to use math language while reading the problems, while working with the problems, when sharing work, and when asking questions related to the problems.
- The students had frequent opportunities to demonstrate content knowledge while solving problems, when sharing work, and when giving feedback.
- Language skills were developed during the lessons. Mostly reading, writing (in order to solve problems), and speaking (to explain reasons to support answers). Listening took place mostly during the interactions teacher/student and student/student.

- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.
- Feedback was mostly led by the students in both lessons; Patty supported class feedback or encouraged students to make corrections of mistakes on their own.
- There was no consolidation of learning at the end of the class.
- Most of the activities developed during the lesson were good opportunities for assessment.

Fifth grade: **Observation one.**

The first observation took place on September 24, 2015 from 9:55 to 10:45. The desks were arranged in a semi-circle facing the whiteboard; thus, the students could see each other. The teacher's desk was next to the window, out of the circle. The students looked for their math books and notebooks as soon as the teacher arrived in the classroom.

Patty checked prior knowledge by asking the students to look and solve a multiplication 400 x 500. The students wrote the operation in their notebooks. The teacher asked the students to choose different colors to highlight basic facts about multiplication. As some students did not know what highlighting meant, the teacher explained and modeled what they had to do.

A student responded in English that "there are two factors that we multiply and the result is the product." The teacher praised the student's response. Another student attempted to reply about facts of multiplication by saying that there are some properties, but she was not clear about them. Another student was asked to explain how to find the product. The student said that they had to add four hundred, five hundred times. The teacher told the girls that they had done a good job.

Patty introduced the concept of multiplication patterns by showing the students that 400 x 500 is the same as multiplying 4x5 and adding the amount of zeroes according to the numbers multiplied. The teacher wrote a model on the board ($4 \times 5 = 20$; $4 \times 50 = (4 \times 5) \times 10^1 = 200$; $4 \times 500 = (4 \times 5) \times 10^2 = 2000$; $40 \times 500 = (4 \times 5) \times 10^3 = 20000$). As the teacher wrote each example, she explained concepts (such as power, exponent, and thousands) necessary to read the operations mathematically. The students were engaged with the topic. They seemed to understand what the teacher was explaining.

The teacher gave more examples and chose students randomly to solve the operations (3 x 4; 3 x 40; 3 x 400; 30 x 400) the students who passed to the board tried to explain in English what they were doing, but some fount it too complicated to explain in English and they said the words that they did not know how to say ("10 a la dos") in Spanish. The teacher gave input to say in English "10 to the second power."

The teacher asked the students to work in the book, on page 21. The exercise was very similar to the exercises that the teacher had modelled on the board. The teacher gave them five minutes. The students worked individually in their books; they did not ask for help during the exercise, neither to the teacher nor to any other classmate. The teacher walked around the classroom to monitor the students' work, but she did not give any feedback or scaffolding because the students had found the task very easy

The teacher asked the students to stop because the time was over. Although, most of the students had already finished their task, there were two girls who were finishing the last two exercises. They finished just before the teacher started checking. In order to check, the teacher asked students to compare with their classmates to see if there were similarities or difference in their answers, but they were not allowed to change their answers. During this exchange of information, the students spoke in Spanish. Then the teacher asked them to communicate in English. Curiously, two of the students did not exchange even a word. They just exchanged notebooks and saw the answers. The teacher did not realize this.

In order to review the work with all of the class, Patty chose volunteers to share their answer with the rest of the class. The students had to go to the board and solve their problem. After solving her task, the student at the board had to ask to the rest of the class if they agreed or disagreed with her, allowing her classmates to give her feedback. At this point, all the interaction was in English. One of the students asked improperly ("you agree?"), but the teacher told her the correct way to ask ("Do you agree or disagree with me?"). The student asked again using the correct form. One student disagreed with the girl's answer. The teacher asked her to explain why she disagreed; but before the student could answer, the girl at the board discovered her mistake (she had not written the right exponent $30 \times 700 = (3x7) \times 10^3$; instead she wrote $(3x7) \times 10^2$). Then the student explained why she was wrong ("I put two, and is three because they are three zeroes"). All the students were engaged and wanted to pass to the board. The teacher raffled the turns. The winner had to pass to the front in order to solve the problem and explain her answer.

After checking, the teacher assigned another task to the students. In their notebooks, they had to complete a chart by filling the gaps to complete the multiplication patterns. While the students worked in their notebooks, the teacher monitored the students' work.

The girls could complete the task in the time given. “The bell ring” the students said. The teacher announced that the class was over. The teacher left the classroom.

Fifth grade: Observation two.

The second observation took place on October 15, 2015 from 9:55 to 10:45. The desks were arranged in rows. All the students were facing the board and the teacher’s desk was by the window, near the board.

The teacher started the class asking the students to describe what a numerical expression was. The students mentioned the parts of a numerical expression (“The numerical expressions has numbers.”). The teacher told the student that she had to say “have” rather than” has.” As the students seemed to not understand what numerical expressions are, the teacher told them that they would devote the lesson learning about numerical expressions. The teacher asked the students to give her examples of operation signs. Thus the students started mentioning the signs they knew (plus, minus, times and divided by). The teacher wrote examples of numerical expressions on the board and asked the students to identify the operation signs in the different operations. Quickly, the students solved the problem, demonstrating knowledge of the content.

The teacher told the students that they would work in teams. The teacher chose the teams randomly by asking students to choose numbers from 1 to 14, then she joined the students (for example one with three and seven, until she made four groups of three and one of two). The students suggested ideas to divide the class in groups of three and four, but the teacher preferred the random option she had already used. As the groups were organized, the teacher assigned word problems to the groups. The students had to read the problem and discuss in order to choose the best numerical expression to solve each problem. Previously, the teacher showed a model on the board (A boy has 54 paper clips in a bag, but he has to equally share the clips with three students more. What should the boy do to solve this problem?) and asked the students to help her decide what to do to solve the problem.

The students participated and helped Patty identify and carry out the steps to solve the problem. They identified relevant information, suggested a numerical expression, and verified if the chosen option was right. A student volunteered to solve the problem on the board. She wrote "54 divided by 4." The rest of the class gave feedback to the girl who attempted to solve the problem by saying that she was right. The teacher asked the students to tell them how they knew which numerical expression to use when solving the problem. The teacher asked the students to check clue words to solve the problem. Automatically, a student responded: "share and equally." For her, those were words that signaled the need to use division.

The teams started working on the floor. As soon as the groups were ready, the teacher explained how the task would be done. The students had to open the book, on the page 44 and put the notebook on top of the book. Then the teacher assigned a random problem for all the teams (first problem one, then two, after three, and finally thirteen). The groups had to solve the problem, and the groups that finished first had to raise their hands to show that they had completed the task. The first group that finished had to tell the answer and if it was correct, they would win a point.

While working, the students read the problems in English, but spoke among themselves in Spanish. When they had a question, they addressed the teacher in English. Since all the groups wanted the points, the participants worked as fast as they could to complete the task. One group finished the first problem; they all raised their hands and had the opportunity to share their work (an addition and a multiplication). The teacher asked the students to show the process to solve the problem. Because the answer was correct and the process was valid, the group obtained a point. The teacher marked their point with a tally mark and asked the students to tell her the name of that sign. Initially the students could not remember what the name was. Thus the teacher told them that they had to find out the name of the sign as homework. Finally, a student cried out "tally mark." All the class was happy because it was no longer their homework. They thanked their classmate.

As the game turned more competitive, some students starting solving the problems individually; they did not discuss with each other, and they just shared the answer. Again, the first group that finished read the problem and gave the answer. The rest of the class participated by saying whether they agreed or disagreed with the group's answer by showing thumbs up or down. The problems were varied some had different numerical expressions; therefore, the students had to read in order to solve the problems properly.

After realizing that the team one was winning, a student said "lo importante es hacer la tarea." The teacher asked the student to repeat what she had said in English, and the student did: "The most important is to do the homework." The teacher explained that in this case she should not say homework but task.

The last problem (thirteen) was more complex and was worth five points. The students had to match four word problems with four numerical expressions. Each numerical expression had two operations together. The teacher asked a student to read the problem for all the class. Because the students made pronunciation mistakes, the teacher helped her by telling the girl how to pronounce properly. As soon as the girl finished reading, all the groups started to work on solving the problem. Two groups finished at the same time, but the teacher waited until all the groups had finished. The students compared their answers; three of the groups had the same answer, but one group had a different one. The teacher asked students to explain their answers and after comparing, they realized that the group that had the different answer was right. They realized that the word “release” was a clue for subtraction; however, they chose addition. Team 4 was the winner.

Patty wrote another problem on the board; this time to be solved independently. (Peter went shopping. He had $80, so he bought pants and a t-shirt. The pants cost $40 and the t-shirt $27. Write a numerical expression to show Peter’s purchase. Determine how much money Peter has spent and much is left.). The teacher gave two minutes to solve the problem (but the students actually spent five minutes because they wrote the problem in their notebooks). The teacher asked the students to turn the notebook facedown when they finished solving the problem.

The teacher checked the students’ work and answered individual questions. The questions were commonly related to vocabulary; a student asked for the meaning of “spent” teacher explained “he bought pants, so does he have the same amount of money?” the student said that no. The teacher told her that “Peter has spent money.” Then, the student told the teacher that she had understood. The student started solving the problem. The teacher started counting backwards from 10 to 0 to indicate that the time was about to end. All the students finished in the time given.

The teacher asked a student to read the problem and asked another student to give her the answer. The student wrote the answer on the board, and the teacher asked the students to turn the notebook around if they had the same answer. Two girls had different answers, so the teacher asked students to share their answers and say why they did it that way. The students had associated in a different way (rather than writing 80 – (40 + 27), they wrote (80 – 40) + 27). The teacher asked the students to explain why the position of the parenthesis changed the solution of the problem and she also encouraged the students to read the problem again; then she asked the students to highlight the information given in the problem. The students realized their mistake and made corrections. The class ended; the teacher said goodbye and left the classroom.

CLIL aspects observed in fifth grade.

From the template (see appendices 24 and 25), the following aspects related to CLIL were observed:

- The content objective was implicit; it was inferred throughout the development of the lessons.
- There was no explicit evidence of language objective, but it could be inferred a type of objective which pointed to reading and writing numerical expressions and complex multiplications.
- Patty gave language support for the students during the lessons.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course.
- Patty emphasized subject vocabulary during the classes.

- There was a review of key vocabulary, when necessary.
- Patty clearly and intentionally explained the content through different activities.
- There was little connection between the problems solved in the class with the students' context. The problems were mostly taken from the book.
- The teacher used scaffolding strategies such as modeling, explaining step-by-step. The teacher gave individual support to the students and language support, when necessary.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas.
- The students interacted when working in groups (although this interaction was mostly in Spanish), while sharing work, and when giving feedback.
- The students had plenty of time to think and respond to input.
- Materials and resources are accurate for the age, level and learning objectives.
- The students had frequent opportunities to use math language during the lessons, especially when explaining reasons to choose an operation and no other.
- The students had frequent opportunities to demonstrate content knowledge during the lessons.
- Language skills were developed during the lessons. Mostly reading, writing (in order to solve problems), and speaking (to explain reasons to support answers). Listening took place mostly during the interactions teacher/student and student/student.
- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.

- There was evidence of feedback during the lessons. It was mostly peer feedback. The teacher mostly supported the students' feedback or helped the students realize and correct mistakes.
- In the first observation there was a type of wrap-up activity, but there was no feedback of it; in the second lesson there was no consolidation at all.
- Most activities during the lesson were good opportunities for assessment.

Sixth grade: Observation one.

This observation took place on October 1, 2015 from 10:45 to 11:35. The classroom was arranged in rows; all the students were looking at the board, and the teacher's desk was in a corner, near the board. The teacher arrived, but the students were still picking up the books and notebooks used in the previous lesson. The teacher gave two minutes to the students to organize everything for the class of mathematics

Patty greeted the students and started the class. She asked the students to tell her what they had talked about the last class. A student answered that they had been speaking about decimals. The teacher agreed; then she wrote the problem of the day on the board. The teacher told the students that they had three minutes to write the problem in the notebook and solve it (it was a multiple choice problem in which the students had to calculate the area of a rectangle. In order to solve it the students had to multiply 3.5 x 14). One student asked the teacher if the possible answers were correct because none of them were decimals.

The teacher walked around to monitor students' work. Only two students finished before the time was over; the rest took longer than the assigned time. When all the students finished solving the problem, the teacher asked them to compare answers with different partners. They were not allowed to change their answer. The teacher asked a student to explain what operation was required to solve the problem. The girl explained that it was a multiplication. The teacher asked if anybody had a different way to solve it, but there was no response from the students. Then, the teacher asked the students to identify clue words that led them to use multiplication. The students mentioned “rectangular shape” and “area” the rest of the students agreed with the answer. One girl mentioned that she estimated the decimals by rounding and got the answer.

After finding the solution of the problem, the teacher reviewed the rules of multiplying decimals. She asked the students to help her multiply 22.5 x 13.2. The students started describing each step while solving the multiplication. Evidently, they knew the process. The teacher emphasized the number of spaces they had to count in order to place the decimal point.

Patty put students into pairs and told them that they would need to solve some multiplications and word problems with decimals (pages 33 and 34 in the book). They would not solve all the exercises. Some groups only worked on the odd number exercises (exercise or problem 1, 3, 5, 7 and so on), while others worked on the even numbers. The teacher told the girls that they had fifteen minutes to solve the task, and she programmed the alarm in her phone to control time.

While working, the students always approached the teacher in English, and the teacher answered in English all the time. However, they interacted with each other in Spanish. The teacher gave some instructions about a group of exercises. The teacher monitored students’ work and solved questions when required. Although they were working together, most of the groups decided to divide the task. Each one in the group was solving a part of the task. Fifteen minutes later, the teacher's alarm indicated that the time was over, but no group had completed all the tasks. Students were able to do between 4 and 7 exercises out of 8. One group had difficulties with the problem and only solved only one exercise. The teacher gave five minutes more to finish. Five minutes later, the groups with the same exercises compared their answers and talked about difficulties they had experienced when solving the task. The students kept on interacting in Spanish to compare solutions. They helped each other. The bell rang and the class ended.

Sixth grade: Observation two.

Patty's second observation took place on October 27, 2015 from 7:45 to 8: 35. The classroom was arranged the same way as in the first observation.

To start the class, the teacher wrote "positive and negative numbers" on the board and asked the students to tell her when they use negative and positive numbers in real life. The students told the teacher that they used positive numbers all the time: to measure temperature, distance, time, weight, pressure, and other examples. As the examples were about positive numbers, the teacher asked the students to tell her when they used negative numbers. Some of the students' answers were: "When we're sick, we use a thermometer; when we are in an ocean… underwater. The teacher said: "to measure losing weight"; to subtract for example 5-6, the answer is a negative number." Then the teacher concluded that according to the examples that the girls had given, negative numbers were not only used to measure temperature.

For the next stage of the class, the teacher asked the students to make groups of four and gave flashcards with images of people and places in different parts of the world to the groups. Then she asked them to say which type of numbers they could use to measure the temperature in the pictures shown in the flashcards. The teacher gave 3 minutes to each group to observe their picture and agree on an answer. While planning and deciding what to say, some students spoke in English between themselves, but others spoke in Spanish. There was a student alone, so the teacher invited her to join a group. The teacher walked around to monitor the students' work. The students were speculating about possible temperatures. The teacher's support to the groups was always in English.

The planning time ended and the groups started to show their flashcard. The first group described the people, the place, and the climate in their flashcard. The teacher asked how they knew about the climate. The students mentioned that the clue was the people's clothes. They said that from the picture, they could think about measuring the temperature, the height of the children (the students already said the children's tall and the teacher helped them realize that they had to use the mathematical term "height"). The students explained that in this case they used positive numbers to measure temperature because they use 0 or below when the temperature was cold, but in this case (it seemed like it was in Africa), the temperature was warm. The teacher made language corrections while presenting (for example saying children rather than childs).

The second group described a picture in a cold place (probably Siberia). They mentioned the snow, the dog (which was actually a wolf) with a lot of "hair" (a girl made the correction and said that they meant fur). The students tried to explain that the fur kept the wolf warm. Since they did not remember how to say warm, they asked how to say *calientito* in English. Some classmates helped by telling them "warm." The students expanded the description, and the teacher helped them point to the purpose of the activity. Students concluded that they would use negative numbers to measure the temperature because it was below zero.

The third group had a card with people in China. The students described the people saying that they would not use negative numbers to describe the temperature in the picture. Because of the way people were dressed, they thought that it seemed to have a cold temperature but not below zero as shown in the previous picture. They thought that the people in the picture were in a cold place. The teacher asked them to compare their picture with the previous picture for a while. The students pointed out aspects such as clothes and snow in the first picture. Therefore, they concluded that in the first picture the temperature is colder than in their picture. They confirmed that to measure temperature in their picture, they would use positive numbers. They concluded that the temperature would be close to 0, but not below. The teacher gave input to think what else they could measure. The students' output was the height of the mountains, the depth of water (there was a kind of lake), and the height of the children.

The fourth group mentioned that they had a girl in Japan. Their classmates asked how they knew; the group said that because of their clothes. The group concluded that it was seemed like it was in spring because of the green around and the clothes that the people in the picture were wearing. They decided that they had to use positive numbers to measure the temperature in their picture. Compared with the previous pictures, they estimated that the temperature was warmer than in the other images.

To conclude the activity, the teacher asked the students to summarize what they had found in the four images. The students were eager to participate. One student concluded that the temperature was different in all of the pictures. Another said that they used geographical features to identify what makes them colder than the other. Another student dared to estimate the temperatures in the pictures (30° in the first picture, 0° C or below in the second, 10° in the third and 20 or 22° in the last picture). A student also wanted to mention that sea level influenced the temperature, but as she did not know how to say it, she asked how to say "*nivel del mar"* they started saying "sea…" finally the teacher told them "sea level." Another student mentioned that they could also measure the height of the plant that was in the picture of the girl in China.

After finishing this part of the class, Patty used a Frayer model to define positive and negative numbers. She explained that they had to define positive and negative numbers, mention characteristics of each, write some interesting facts about them, and give non-example cases. The teacher gave bond paper to each group. They had to make the model and display it somewhere around the classroom. The students started working on the floor. The teacher displayed the Frayer model on the board (definition, characteristics, examples, and non-examples) in order to show the model to the students. Patty asked the student to say another name for the model they were using. Some students said that it was a graphic organizer. Then the teacher inquired about the device the students were using to draw the lines. The students told the teacher that they were using a ruler. Then the teacher asked the girls to tell her the type of numbers that they could see in the ruler. Some students said that there were positive and negative numbers. The teacher asked them if they were sure, so a student made the correction; she said “only positive numbers.” Since they did not have enough time to complete the task, the teacher asked the students to write their names on their paper and return it to continue working during the next class. Finally, the teacher asked if people could use positive and negative numbers in daily life. A student said yes, but that it depended on the situation. As homework, the teacher asked the students to find out if it is possible to subtract a positive number from a negative number. They would discuss their thoughts in the next class. The class ended and the teacher said goodbye and left the classroom.

CLIL aspects observed in sixth grade.

From the template (see appendices 26 and 27), the following aspects were observed:

- The content objective was implicit; it was inferred throughout the development of the lessons.
- There was no evidence of language objective in the first observation, but in the second observation, the language objective was implicit; it was easily inferred throughout the development of the lesson.
- The content was appropriate for the level and age of the students and aligned to the syllabus of the course.
- There was no introduction of new subject vocabulary during the lessons. However, there was emphasis in subject vocabulary during the classes. Probably

it was introduced in other lesson because the students were familiar with math words related to the topics.

- There was a review of key vocabulary during the lessons.
- Patty intentionally explained the content through different activities.
- In the first class observed, there was little connection between the problems solved and the students' context. The problems were mostly taken from the book. In the second observation there was an evident personalization of the content.
- The teacher used scaffolding strategies such as reviewing the rules to multiply decimals, monitoring students' work, providing language support, and using graphic organizers.
- There were frequent opportunities for the teacher to interact, clarify questions, and exchange ideas.
- The students interacted when working in groups; however, in the first lesson, most of the interaction between students was in Spanish. In the second observation, the interaction of the students was mostly in English.
- The students had plenty of time to think and respond to input.
- Materials and resources are accurate for the age, level and learning objectives.
- The students had frequent opportunities to use math language while solving problems, planning, and carrying out tasks and when presenting work to the rest of the class.
- The students had frequent opportunities to demonstrate content knowledge during the lessons.

- Three language skills were evident during the classes. The students were mostly reading, listening, and speaking.
- The students were engaged during the lessons.
- The teacher's pace was appropriate to the students' abilities and level.
- There was evidence of feedback during the lessons—mostly peer feedback.
- In the first observation there was no consolidation of learning. The class was unfinished. In the second class observed, there was a conclusion at the end of the main activity in which the students demonstrated understanding of the content.
- The activities developed during the lessons were good opportunities for assessment.

Curriculum Analysis

The last source of information for this study was the analysis of the first term of the GLC math curriculum from first to sixth grade (See appendices from 28 to 33). This description of the analysis begins with general aspects of the curriculum, then turns to content objectives and, finally, discusses language aspects.

The first significant aspect to note in this analysis is that there is no suggestion of CLIL or any other methodology to be implemented to teach mathematics at GLC in any of the curriculum for the grades that were analyzed. The curriculum contains the main standard, the benchmark, the outcomes for the term, the specific content to be taught, and the subject specific vocabulary that supports the content.

The yearly standard mainly focuses on development of math skills in the different math components (numbers and the numerical system, measurement, geometry, statistics, probability, and calculation) in order to solve daily and academic problems. It can be concluded that it is a problem-solving based program. While it turns more challenging from grade to grade, it keeps a spiral structure in which the standards seem to retake the same mathematical components of a previous year and study them in a deeper way year after year. Thus, the curriculum becomes more challenging from grade to grade.

The benchmark, which is the main learning objective to be achieved in the term, also points to content, mostly using math knowledge to solve problems. Only the benchmark in fifth grade seems to be focused on language but with a strong component of content. This can be seen for example, in the following: “Argument the steps and strategies needed to solve different types of problems, based on experience with the set theory, numbers and the number system, geometry and using skills to solve basic operations” (see Appendix 32, item 2).

One of the essential aspects of CLIL—content—can be seen clearly in the objectives for each course. These content objectives are clearly detailed as outcomes and determine what should be taught and learned in the first term. They are tightly connected to the benchmark and the standard. From second to sixth grade, there is a classification of content which points to develop five components: numbers and the numerical system, the set theory, calculation, problem solving skills (which are studied during the whole school year), and geometry. In first grade there is no development of problem solving skills in the first term (see Appendix 28, item 5).

While there are clear content objectives, the curriculum does not have any specific category in which language objectives can be clearly identified, except with regards to vocabulary. Each grade has a list of specific subject vocabulary related to the content to be taught during the term. In third grade, there is a note for the teacher in order to define the concept of cardinality in a set (see Appendix 30, item 6). However, the other linguistic skills and functions are not clearly identified. Only in fifth grade is there an evident language objective in the outcomes for the term: “Describes how angle measures can affect the properties and classification of a figure” (Appendix 32, item 4). In the rest of the grades, there are some outputs within the content that could be considered as language objectives due to the purpose they aim to achieve and the functional language required to accomplish some tasks. Outputs such as “Describes 2D and 3D shapes, determining the number of sides and vertices, faces, types of faces and how they move” (Appendix 28, item 7) in first grade; explaining methods and procedures and writing a number story to go on calculation in second grade and third grade (Appendices 29 and 30, item 7), explaining concepts, describing the position of a square in the coordinate plane, explaining reasons for choosing multiplication strategies, and describing number sequences in fourth and fifth grade (Appendices 31 and 32, item 7); and, finally, explaining methods, justifying reasoning, orally as well as written, and making and testing hypothesis in fifth and sixth grade (Appendices 32 and 33, item 7).

V. Discussion

The following section reports the reflections obtained from the analysis of the results achieved from the class observations, the interviews, and the analysis of the first term of the math curriculum from first to sixth grade. It also describes how the information obtained provides answers for the research questions that frame this study. The analysis was made according to the results of the triangulation of all of the three sources of information used for this study (see Appendix 34 for more detailed information) and supported in the theoretical framework which provides the literature that validates the reliability of this study. In order to answer the main research question (How is CLIL being implemented by math teachers at GLC in primary levels?"), in the sections that follow the researcher will discuss the secondary research questions of this study separately and after revising the conclusions obtained from the discussion of all of the questions, the researcher will focus on how the evidence obtained explain how CLIL is being implemented in the classroom.

What current methodology do primary math teachers at GLC implement to develop their lessons?

It is important to notice that in order to answer this question, the information presented only refers to that obtained from the interviews and the observations due to the fact that the curriculum does not provide any suggestion of a specific "methodology" for teaching mathematics. This curriculum mostly focuses on the specific standard to be achieved, the benchmark (main goal) for the term, the outcomes for each grade, the specific content to be taught, and the specific subject vocabulary to support the content.

To contextualize this research question, it is necessary to consider the fact that math teachers at GLC have been implementing CLIL to teach mathematics since 2012; therefore, the researcher will focus on some characteristics of a CLIL lesson in order to show the correlation between the methodology implemented in the classroom and the characteristics of a well-planned CLIL lesson. It is vital to remember that a CLIL lesson is focused in the content as well as in the language required to precisely understand the content. The aspects concerning content and language will be analyzed in detail in the proceeding questions. For this question, the researcher will focus on the stages of the lesson, how interaction takes place in the class, contextualization of the content, the connection with “culture,” and what feedback and scaffolding strategies are implemented in the math lessons.

First of all, the researcher will retake the stages of a CLIL lesson and will compare them with the stages of the lesson currently implemented by math teachers at GLC. According to Coyle et al. (2010), a CLIL lesson should contain a “warm up” session which aims at activating prior knowledge; the “main introductory stage” designed to provide activities which familiarize the students with the new content; the “main learning stage” which fosters application of knowledge and promotes cooperative learning; the “extension activities” which promote the application of learning by fostering reflection on the content through the implementation of projects; the “consolidation of learning and subject vocabulary” which is a wrap-up activity that aims at reviewing subject vocabulary, main content and language learning; and finally, the self-assessment which fosters metacognition and awareness of learning.

In the interviews, the teachers showed some familiarity with some of the stages of a CLIL lesson. In the first interview, Patty explained that they "manage the stages of the class, so it has a warm up, it has a model activity, then we have an activity that is done by the students... there is feedback of the activity" (Appendix 12, #12). In the observations there was a noticeable attempt to implement CLIL in the math lessons and the teachers actually developed some stages of a CLIL lesson in their classes. In most of the lessons observed, the teachers started with a "warm up section" in which they usually aimed at activating the students' prior knowledge of the content and establishing relationships in order to link new knowledge with previous content. In addition, most of the teachers provided different activities to help the students get familiarized with the new content in what could be named as the "main introductory stage of the class." However, in spite of the fact that the teachers encouraged the students to link previous knowledge with the new content, there was no evidence of clear learning objectives to be achieved during the lessons; neither language nor content objectives were presented to the students before starting the lesson. This aspect will be analyzed in detail in the following questions.

Although the teachers promoted opportunities for application of knowledge, most of the times the math book was the only resource to demonstrate the students' knowledge of the content by solving problems contained in the textbook. Some of the lessons observed attempted to motivate the students to work in groups, but there was no product coming from the innovation or creativity of the students. They were mostly solving problems from the textbook in groups. Consequently, the interaction in most of classes observed was focused on the teacher providing input (by explaining the content, modelling a task or giving instructions), students interacting with the book, and students interacting with classmates (when sharing answers or giving peer's feedback). Few activities attempted to foster cooperative learning. This aspect demonstrates that the students seem to be working with decontextualized materials which may limit the students to only developing skills mechanically. In addition, there was no evidence of extension activities during the observations nor do the teachers mention it in the interviews

A consequence of the dynamic of these types of lessons is that one of the four Cs "culture" (Coyle et al., 2010, p.54), which precisely aims at helping the learners to understand the content based on the framework of their own culture, has not been taken into consideration in the math lessons in primary at GLC. Therefore, there is no social mediation that can reflexively relate the content and the language as claimed by Barwell (2005). Only in the second class observed in sixth grade was there a type of connection between content and reality when the students had to describe how positive and negative numbers are used in real life based on pictures showing images from different places of the world.

Regarding the consolidation of learning, most of the teachers mentioned in the interview that this was an important stage in the lesson. Betty, for instance mentioned "we also have activities and like a close up of the class, so they can …finish the class understanding what they learned" (Appendix 10, #16); therefore, they are aware of the importance of this stage of the class. However, in the classes observed, few teachers were able to complete this stage. It seemed that in most of the classes observed the teachers did not have plenty of time to complete this part of the lesson.

Something positive observed in all the lessons and confirmed in the interviews is the fact that the teachers implemented peers feedback during the math lessons, providing plenty opportunities for self-assessment and fostering the students' ability to evaluate their partners and evaluate their own learning. During the first interview, Patty mentioned that "most of the times they check between them or in groups or the teacher goes around and at the end there is feedback of the activity" (Appendix 12, #12). It was positive to realize how the students were able to identify their own mistakes and make corrections on their own during the feedback sections. These types of activities kept the students engaged during the lessons.

Another relevant aspect of CLIL is the importance of scaffolding during the lessons. Scaffolding is founded on the principle of Vygotsky's zone of proximal development and points to all of those activities that the students do either with the support of adults, in this case the teachers, or "in collaboration with them". (Zaretskii, 2010, p. 70) During the interviews, the teachers demonstrated that they are familiar with the concept of scaffolding and they recognize the usefulness of teacher's support in the process of learning. They mentioned: "when I am with the small girls, seven /eight years old, I have to scaffold the problem" (Betty, Appendix 13, #4); "scaffolding is a very important strategy when you are working with little kids" (Glory, Appendix 14, #4).

Nevertheless, teachers mostly related scaffolding with modelling "Usually we model a problem and then they have to create their own problems" (Patty, Appendix 15, #16). During the observations the researcher could confirm some scaffolding during the lessons. However as mentioned during the interviews, the most common strategy used in the lessons was modelling. The teachers also provided individual support to those students who required it and plenty of time to develop the tasks according to the students' pace, level, and age.

From the information presented above, the researcher concludes that the math teachers at GLC attempt to implement some of the CLIL aspects analyzed in this section in their classes. They are familiar with CLIL and have learned some important aspects of a CLIL lesson; however, they still need to continue to work in order to improve aspects such as presenting the learning objectives of the lesson, the promotion of cooperative learning and projects, the contextualization of learning as a strategy to mediate between own and foreign cultures, the design of activities to ensure the consolidation of learning, and the implementation of varied scaffolding activities to support learning.

How is general language focused in current math lessons at GLC's primary level?

Communication is a relevant aspect in a CLIL lesson since this approach focuses on language as a vehicle to communicate learning in a natural way; thus, CLIL environments "offer opportunities for authentic communication" (Dalton-Puffer, 2007, p. 201). In a CLIL classroom, communication is founded on the development of general communicative skills and cognitive academic language proficiency (CALPS) (Cummins, 2012). In order to understand the importance of language in a CLIL lesson, it is necessary to review the concept of "language triptych," which refers to the "language of learning, language for learning, and language through learning" required to enhance learning (Coyle et al. 2010, p. 36).

As was mentioned earlier, a current CLIL lesson should develop language objectives parallel to content objectives. The language objectives must be carefully planned in terms of language of learning, which is essential to understand the content; language for learning which enhances all of those cross-curricular and functional language skills necessary to actively participate in typical class activities such as discussions, teamwork, presenting projects, or simply asking questions; and language through learning which points to those unpredictable language needs that arise during the communication process and are proportional to the speaker's fluency and language proficiency (Coyle et al., 2010).

For the purpose of the discussion of this question, the researcher will concentrate on how the curriculum and the math primary teachers at GLC focus general language in the lessons, foster language for learning and language through learning in the classroom, and enrich communicative competence.

The first aspect to analyze is that the curriculum, in most of the courses, shows little evidence of language objectives to be achieved during the first term. Only in fifth grade a language objective can be clearly identified for the term: "describes how angle measures can affect the properties and classification of a figure" (Appendix 32, item 4). However, in the rest of the courses there are some specific outputs within the content that, due to the nature of their aims, seem to aim at the development of some functional language skills. Therefore, they may be useful to design "language of learning" and "language for learning" objectives. In first grade, the students are asked to describe "2D and 3D shapes, determining the number of sides and vertices, faces, types of faces and how they move" (Appendix 28, item 7). In second and third grade, the students have to explain methods and procedures to solve problems and they also have to write a number story to go on calculation (Appendices 29 and 30, item 7). Fourth and fifth graders are required to explain concepts, describe the position of a square in the coordinate plane, explain reasons for choosing multiplication strategies, and describe number sequences (Appendices 31 and 32, item 7). In the last two grades of primary, fifth and sixth grade, the learners are expected to explain methods, justify reasoning orally as well as in writing, and make and test hypotheses (Appendices 32 and 33, item 7). With this support, teachers should be able to plan lessons that not only develop the specific content but also provide the language support required to develop authentic CLIL lessons.

Although the teachers find language as a relevant component of their lesson "we are not only teaching math but also like language arts in another way" (Patty, Appendix 12, #14), it seems that the teachers need to learn more about the triptych because they are mostly relating language to supporting learning academic vocabulary and to language through learning. This can be seen in the excerpts from the interviews below:

> "When it's students' talking time, you let them communicate using the math vocabulary, or if you see that they have difficulties with that, you can implement different strategies like games… filling in the blanks, or things that they have to use the vocabulary to communicate with other friends" (Betty, Appendix 10, #24).

> "…if for example they are telling something to another student or to the teacher and probably they use an incorrect tense of the verb or something like that, we have to tell the girl the correct way and probably the girl has to repeat" (Patty, Appendix 12, #14).

During the observations, the researcher confirmed that the teachers actually support the students when they use wrong expressions or when they do not know how to say a specific word in English; thus they fostered "language through learning." However they seem not to be aware of the importance of designing clear language objectives for their lessons. They were not intentional regarding the language objectives they aimed to achieve in the lessons, and there were no language for learning objective displayed anywhere. Consequently, it was difficult to understand the language purpose of most of the lessons, except for the second class observed in sixth grade in which the students had to describe how negative and positive numbers are used in real life based on a given picture card.

Even though the students spoke in English to the teachers in most of the classes and the teachers constantly gave input in English to the students and encouraged them to speak in English when addressing the teachers or when giving feedback to each other, there were no purposeful activities to foster the development of communicative competence in the math lessons. A good design of a CLIL math lesson should provide scenarios to improve communicative competence which, according to Savignon (1997), refers to the ability that learners develop in order to gain proficiency to express, interpret, and negotiate meaning in psycholinguistic and sociocultural perspectives during the process of acquisition of a second language. Thus, the math lesson should provide support to develop those language skills required to interact spontaneously during the lesson and reduce the use of Spanish in the class.

Unfortunately, this support was not noticeable in most of the lessons observed. The students mostly interacted among themselves in Spanish when working in groups. Actually, first grade students spoke in Spanish almost all of the time. They used English only as output to the teacher's input. In fact, there was an evident mismatch regarding this aspect because Glory had mentioned in the first interview that her students spoke in English among themselves all the time (Appendix 11, #43-46). Conversely, second and third graders attempted to address to the teacher in English, but they mostly asked questions to the teacher in Spanish. In response, the teacher answered them in English and encouraged the students to repeat their ideas or questions in English. The teachers recognized that this phenomenon usually takes place in the classroom (Appendix 12, #32). Regarding this aspect, Betty mentioned in one of the interviews that:

> "Normally in second and third grade they are trying to speak in English all the time, sometimes they use Spanglish, they mix. That's a good moment to help them learn more vocabulary…when they are using Spanish words immediately you correct them or you tell them how to do it in English, then they are learning, so they are learning how to communicate in English during the whole class" (Appendix 10, #30).

For her, those moments were good opportunities to support language, but it is necessary to continue to work on the planning of intentional language objectives to enrich interactions in the classroom. In the interviews, the teachers mentioned that sometimes they stop the lessons to teach some grammar when necessary (Appendix 13, #6; Appendix 13, #6, 7, and 8; Appendix 15, #6). However, there was no evidence of this process during the observations.

Another aspect noticed during this study was the little use of communicative skills such as writing and listening in class. The curriculum does not suggest any listening task. It promotes activities such as writing numbers in word name (Appendix 28, item 5), explaining the concept of set (Appendix 29, item 5), and reading and writing numbers up to 1,000,000 (Appendix, 31 item 7). In most of the lessons observed, the researcher found frequent reading activities which mostly fostered reading in order to solve word problems. Speaking took place more often during the lessons, especially as output from teacher's input, while sharing answers with the rest of the class, or during feedback sections; while the writing process was reduced to writing operations to solve problems. From the interviews, most of the teachers commented that the students also write word problems which are usually modeled by the teacher (Appendix 13, #14; Appendix 15, #12). Listening only takes place during the interaction teacher/ students and student/student.

How is subject academic language being focused in current math lessons at GLC's primary level?

Regarding subject academic vocabulary, it is important to focus on the concepts of Cummins's CALP (Cognitive Academic Language Proficiency) and "language of learning" (Coyle et al., 2010), which use language as a vehicle to understand the content, and it is plenty supported on the subject specific vocabulary needed to interpret and decode information related to the subject. According to Rotman (2006) "any mathematical text is written in a mixture of words, phrases, and locutions drawn from some recognizable natural language together with mathematical marks, signs, symbols, diagrams, and figures that (we suppose) are being used in some systematic and previously agreed upon way" (p. 102). Thus, when teaching mathematics, it is relevant to help the students understand and decode symbols as well as the use of particular vocabulary necessary for learning.

In this study, the researcher found that the curriculum has a specific column in which it is clearly determined the content vocabulary to be developed during the term. Therefore, the teachers have a very explicit guide to follow during the term. The teachers were aware of the importance of teaching the specific subject vocabulary in order to understand mathematics. In the interview, Betty mentioned that it is important to teach the students how to deal with the mathematical language in order to understand problem solving. "They can understand when they are asked to do something, the instructions…Every lesson has a different vocabulary so we learn about that vocabulary" (Appendix 10, #20). Glory, for instance, tries to explain the different meanings of a word and associates specific words with mathematical signs when she said: "If I am working with taking off, I draw the sign" (Appendix 11, #22).

In the classes observed, there was no introduction of objectives to develop "language of learning" or to intentionally develop CALPs, but there were frequent opportunities to use the specific vocabulary of the subject in mathematical contexts, when solving problems on the board or in the math book, when giving feedback, and while sharing answers with the whole class. The researcher did not have the opportunity to see how the teachers introduce subject vocabulary, but a continuous emphasis on vocabulary was evident during most of the lessons. The teachers frequently asked the students to use key vocabulary in their answers and the students found easy to use the subject vocabulary to explain processes such as numerical expressions in the second lesson observed in fifth grade (see Chapter IV, Results from Observation; Fifth Grade: Observation Two) or the name of polygons and specific vocabulary related to geometry in the second class observed in third grade (see Chapter IV, Results from Observation; Third Grade: Observation Two). Evidently, the students were very familiar with the language of mathematics. They understand the meaning of the different signs (addition, subtraction, multiplication and division), and most of them are able to refer clue expressions with specific operations to solve problems.

In the interviews the teachers explained that they use different strategies to teach subject vocabulary such as games, a math glossary in the book, and the vocabulary notebook (Appendix 10, #22). In addition, Patty explained that she frequently uses flashcards with vocabulary and asks the students to match the words with their meanings or with examples (Appendix 12, #16). Conversely, there was no evidence of those flashcards in the classroom. In order to make this aspect more explicit, the teachers could display the vocabulary in the classroom in order to provide visual support to the students.

How is content focused on in current math lessons al GLC's primary level?

Content is another foundation of CLIL. As defined by Wolf (2007), content is a "form of knowledge acquisition" (p. 18). In a CLIL lesson, the content aims at developing all those skills that improve the learners' expertise in a subject. The content could be related to theories, formulae, learning concepts, and it is strongly supported on the knowledge of subject specific vocabulary that eases understanding.

The curriculum has specific content outcomes to be achieved during the term. The standard and benchmark (main goal for the term) clearly emphasize content focused on numbers and the numerical system, measurement, geometry, statistics, probability, and calculation development in most of the grades. The only exception is for fifth grade in which the benchmark attempts to develop a more language-focused objective: "Argument the steps and strategies needed to solve different types of problems, based on experience with the set theory, numbers and the number system, geometry and using skills to solve basic operations" (Appendix 32, item 2). There is also a specific column in the curriculum that describes the content to be developed during the term. All of this curricular content focus would explain why the teachers give more relevance to content than to language during their lessons.

In the interviews, the teachers talked about some of the strategies that they implement to teach the content for instance through problems "the problem of the day" (Appendix 10, #26), manipulatives such as counters or candies (Appendix 11, #30), and all of them coincide on using the math book as a tool to teach the content, as evidenced in the excerpt from the interview: "We have a textbook that is really good" (Patty, Appendix 12, #20)**.** Clearly, during the observations, the researcher could see how the content was the center of the class. The researcher also confirmed some of the strategies mentioned in the interviews. Glory for instance, actually uses manipulatives to teach additions and subtractions; Betty and Patty solved problems in their lessons, and certainly, the book was the main tool to teach the content. In spite of all these activities in class, paradoxically, the researcher noticed that the content objectives were not clearly shown to the students at any moment during the lessons observed. The objective was implicit, and the researcher could determine the aim of the lesson, but the students did not have a clear written content purpose to achieve during the class.

Another fact observed by the researcher is the agreement between the content suggested in the curriculum for each grade and the content taught in class, so the teachers followed the directions stated in the curriculum. Therefore, the content was appropriate for the level and age of the students. In most of the lessons, the teachers offered varied opportunities to intentionally guide the learning of the content and provided activities in which the students demonstrated knowledge of the content; they especially focused on solving problems, and the students demonstrated engagement during the lessons.

Evidently, the content is a strong aspect for the teaching of mathematics at GLC. However, it would be useful to implement more varied strategies to teach the content. Although the book may be a good tool for learning, the students should develop and train in skills based on real life experience which could help the students understand the importance of learning mathematics and might foster the creation of what Bailey (2014) calls “a mathematical learning environment” (p. 87). This type of learning environment should include “collaboration, inquired-based projects and support with mathematics content” (p. 87). Thus, learning the content might become a more meaningful practice that also might foster more cooperative learning.

Regarding solving problems, a math teacher should ensure the acquisition of the skills necessary to help the learners become a good problem solver who, according to Campbell, Adams, and Davis (2007), should observe “the complexity of the cognitive demands of interpreting and understanding the problem and the testing situation” (p. 9). In order to make problem solving more meaningful, the teachers should choose situations related to the students’ daily experience. The teacher should promote activities such as deciding how much money to spend in snacks at recess or identifying what percentage of red candies are in a bag of “Sparkies.” These types of activities might engage the students to learn mathematics for a purpose; as consequence, the students could find the usefulness of learning mathematics, and they might also develop the skills required to solve problems efficiently.

How is CLIL being implemented by math teachers at GLC in primary levels?

From the analysis of all of the four research questions, the researcher has concluded that the primary math teachers at GLC have been attempting to implement CLIL in their lessons; they are planning lessons which aim to follow some of the stages of a typical CLIL lesson such as warm up, the main introductory stage, the main learning stage, and the consolidation phase. In general, the lessons have a good environment, and the students mostly show an interest in learning and participating spontaneously in class. However, the teachers need to continue to improve the main learning stage, plan extension activities and improve the quality of the consolidation of the lesson. It is necessary to create more opportunities for cooperative learning and the consolidation of learning and subject vocabulary.

Another relevant aspect is the need to design clear content and language objectives which should be explicitly shown to the students in order to help them be more aware of the achievement of their goals during the lesson. The teachers are clear about the content to be learned; however, they are not allowing the students intentionally develop an awareness of learning. Besides, language is learned incidentally, without a systematic building of mathematical vocabulary and structures necessary to do math in English. Therefore, adding language objectives would be useful since they are a guide for the teacher because they help fulfil the specific language needs required to understand the content, interact in class, and improve language proficiency.

At GLC, the content plays an important role in the development of the lesson. Most of the lessons are content centered and the teachers provide opportunities to train math skills and subject specific vocabulary. The teachers also implement some scaffolding activities, but it is necessary to continue to learn about more scaffolding strategies to offer more varied supportive activities to help the students understand the content according to their needs. To ensure the learning of the content, the teachers implement peer-feedback, which is supported as a CLIL technique, so the students can evaluate their classmates and actually learn from their own mistakes.

Conversely, the teachers need to be more aware of the importance of language in their lessons. They mostly base language support in language through learning (language needs which arise during the lesson) in terms of unknown vocabulary and the understanding of subject specific vocabulary. The teachers need to start planning more language of learning activities that provide academic support in order to decode the language of mathematics and go beyond simply teaching the vocabulary related to the content. In addition, the teachers need to think about functional language support (language for learning) in order to reduce the use of Spanish during the interaction between the students and provide tools to use language in a more natural way during the class.

Finally, language objectives that build upon the content to be taught and that systematically build upon each other from grade to grade should be developed and explicitly added to the mathematics curriculum at GLC. If this is done, the arduous job of teasing out language from the content would already be done, and the teachers could focus their energy on developing these language aspects as they teach content. Also, there would be a clear development of mathematic language growth as the students progress through the curriculum.

VI. Conclusions

In this section, the researcher will present the main conclusions obtained after the analysis of the information and the reflection on the research questions presented in the previous section.

As a conclusion, the researcher realized that the math teachers at primary levels in GLC attempt to implement CLIL in their lessons; however, they need to be aware of the importance of the content and language objectives in a CLIL lesson, and they also need to learn more in detail about the underlying foundations of this methodology. Betty, Patty, and Glory require more training in CLIL in order to help them improve some aspects such as varied scaffolding activities, contextualization of content, language support, development of communicative skills and functional language to support the learning of the content, and varied opportunities for team work and the implementation of class projects.

As most of the teachers' experience has been teaching mathematics and the curriculum is evidently content centered, the primary teachers at GLC mostly focus their lessons on content. Therefore, the teachers need training in integrating language with content in order to also fulfill the language needs required to understand mathematics. For instance, the teachers need to learn about communicative competence and language skills in order to foster language proficiency at the same time the students learn mathematics. The teachers also need to be intentional in the design of concrete content and language objectives which will help them plan more effective lessons. Although the teachers mostly speak in English to the students and encourage them to communicate in English, it is necessary to go beyond the perspective of "language through learning" and start working to foster students' development of the “language of learning” and the “language for learning.” Therefore, the objectives must be shown to the students to help them be aware of what is expected to be learned during the lesson.

Finally, the curriculum should be adapted in order to clearly emphasize language objectives for each term, and it also should be precise in stating CLIL as the suggested methodology for teaching mathematics at GLC since it has been implemented during the last four years.

The results obtained from this study, are a good support for GLC since they provide a deep reflection on how teachers implement CLIL in their lessons. Although there is an evident attempt to develop CLIL lessons, there is an evident tendency towards content and a lack of awareness of the importance of language in a CLIL lesson at GLC. The analysis obtained from the current study will hopefully lead to decisions on professional development aspects that will help math teachers at primary level improve their performance in class and implement CLIL in a more effective way.

Implication for Teaching at GLC

First of all, as one of the leaders of the institution, the researcher has the opportunity to share the findings with the teachers individually, highlighting all the positive aspects found in the study and helping the teachers realize ways to improve their lessons by fulfilling the characteristics of a CLIL lesson. Secondly, the researcher will give feedback from the study to the academic director and the school principal in order to provide support to the teachers, either by organizing work sessions at school, in order to learn more about CLIL on their own, or hiring experts who could teach some courses in which the teachers can learn more about how to focus language in the classroom. Finally, the researcher will propose the idea of implementing the strategy of peer-observation in order to learn from each other and enrich the teaching performance from the experience of observing and supporting amongst colleagues. All of these strategies might help GLC's math primary teachers prepare and develop more effective and meaningful math lessons and might result in a good support to improve the students' proficiency in mathematics.

Future Research

In spite of the fact that this study focused on how CLIL is being implemented at GLC in math lessons in primary, a future study could be widened to see how CLIL is being implemented into the other areas that are being taught in English using the CLIL approach or could be broadened to high school. Furthermore, there are two CLIL aspects—cognition and culture—which, due to the complexity of the research, were not analyzed in this study. As consequence, the lack of this information might be a gap that could affect the analysis and reflection on all of the features related to a CLIL lesson. It might result interesting to continue a further study of these aspects in other research projects to analyze how the four basis of CLIL: content, communication, cognition and culture are being currently developed at the primary level at GLC.

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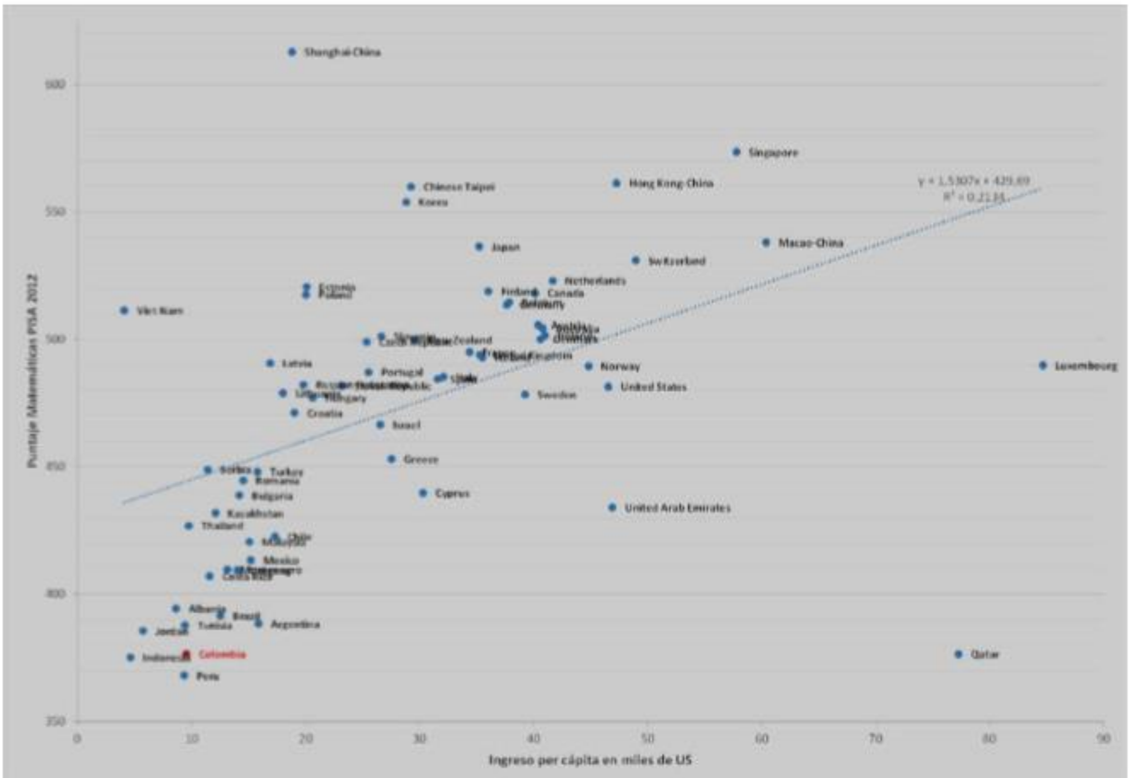
Appendix 1

Report Pisa 2012

Gráfico IV-1. Resultados Pruebas Matemáticas PISA 2012 e ingreso por habitante



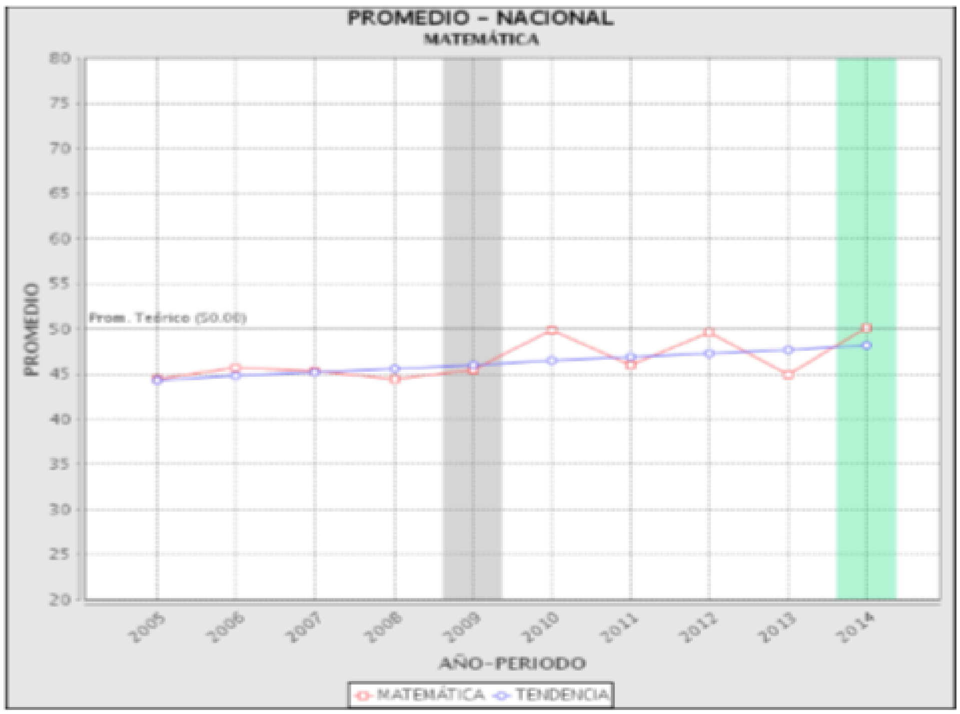
Fuente: Organización para la Cooperación y el Desarrollo Económico (OCDE)

Appendix 2

ICFES Historical report 2005-2014

Nivel Agrupamiento: NACIONAL

Año(s): 2005 - 2014
Prueba: MATEMÁTICA



Instituto Colombiano para la Evalución de la Educación
-ICFES-

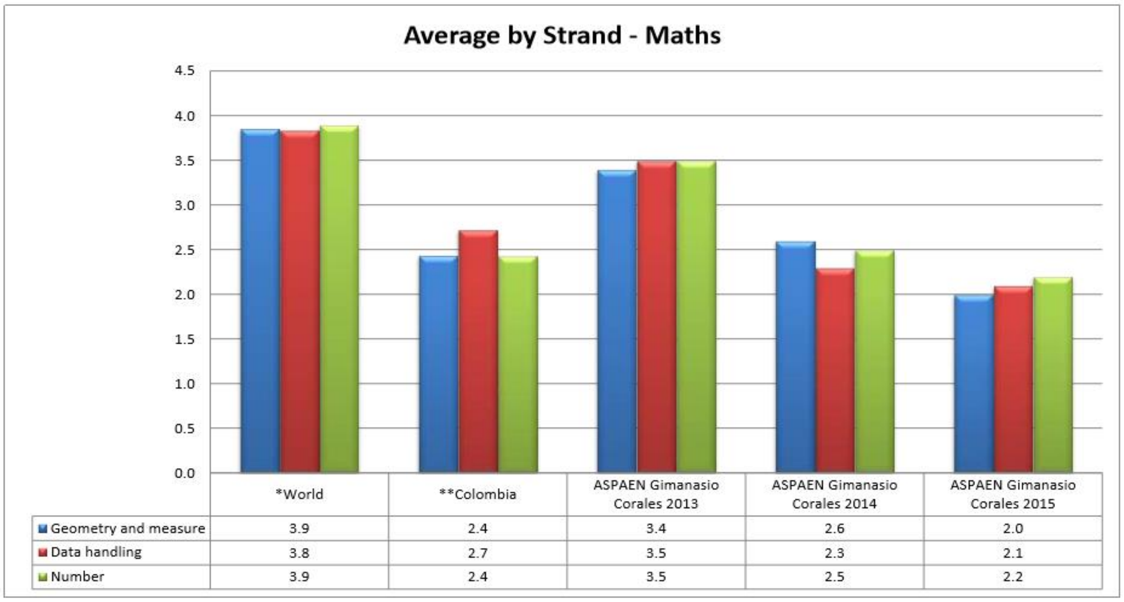
MATEMÁTICA	
AÑO-PERIODO	PROMEDIO
2005	44.44
2006	45.75
2007	45.31
2008	44.48
2009	43.98
2009	45.48
2010	49.90
2011	45.99
2012	45.61
2012	49.56
2013	45.00
2014	50.19

Appendix 3

Cambridge´s statistics

BRITISH COUNCIL

CO060 – ASPAEN Gimnasio Los Corales



	*World	**Colombia	ASPAEN Gimanasio Corales 2013	ASPAEN Gimanasio Corales 2014	ASPAEN Gimanasio Corales 2015
Geometry and measure	3.9	2.4	3.4	2.6	2.0
Data handling	3.8	2.7	3.5	2.3	2.1
Number	3.9	2.4	3.5	2.5	2.2

Scale from 0 to 1.0: very poor; from 1.1 to 2.0: poor; from 2.1 to 3.0 acceptable; from 3.1 to 4.0: good; from 4.1 to 5.0 very good; and from 5.1 to 6.0: excellent

Appendix 4

RUBRICS FOR OBSERVATION

ITEM	3	2	1	0
CONTENT OBJECTIVES	Explicit: Teacher explains and displays the objectives. Students clearly identify the content to be learned.	Explicit: Teacher explains the objectives, but doesn't display them.	Implicit: can be inferred throughout the development of the lesson	No evidence
LANGUAGE OBJECTIVES	Explicit: Teacher explains and displays the objectives. Students clearly identify the language to be learned.	Explicit: Teacher explains the objectives, but doesn't display them.	Implicit: can be inferred throughout the development of the lesson	No evidence
CONTENT CONCEPTS	Appropriate for the level and age of the students; aligned to the syllabus of the course.	Partially appropriate for the level and age of the students; some alignment with the syllabus of the course.	Poorly aligned with the syllabus of the course and the students' age	No correspondence with the age and level of the students. No related to the syllabus.
SUBJECT VOCABULARY	Clearly and intentionally emphasized through accurate activities.	Mentioned, but used in few occasions in some activities	Introduced but not intentionally emphasized.	No evidence
KEY VOCABULARY REVIEW	Clearly and intentionally emphasized through accurate activities.	Mentioned, but used in few occasions in some activities	Introduced but not intentionally emphasized.	No evidence
EXPLANATION OF CONTENT	Clearly and intentionally explained through a variety of activities.	Introduced but with little explanation and/or examples.	Introduced but not clarified. Students seem to have gaps of learning	No explanation of content.

PERSONAIZATION OF CONTENT	Clearly and intentionally related to students' context.	Sometimes connected to the students' context.	Little connection to the students' context.	No evidence
SCAFFOLDING	Very well structured activities aiming at assisting and supporting students' learning	Activities designed to occasionally support students' learning	Little support from the teacher.	No evidence
COMMUNICATION LEARNER/ LEARNER	Frequent opportunities to interact and carry out tasks in groups	Some opportunities to interact and carry out tasks in groups	Few opportunities to interact and carry out tasks in groups	No opportunities for interaction
COMMUNICATION TEACHER / STUDENT	Frequent opportunities to interact, clarify questions, and exchange ideas	Some opportunities to interact, clarify questions, and exchange ideas	Few opportunities to interact, clarify questions, and exchange ideas	No opportunities for interaction
STUDENT'S TIME TO RESPOND	Plenty of time to think and respond to input.	Some time to think and respond to input.	Few time to think and respond to input.	No adequate
MATERIALS AND RESOURCES	Accurate material and resources for the age, level and learning objectives.	Somewhat good material and resources for the age, level and learning objectives.	Inappropriate material and resources for the age, level and learning objectives.	No evidence
LANGUAGE KNOWLEDGE APPLICATION	Frequent opportunities to use language knowledge in different contexts	Some opportunities to use language knowledge in different contexts	Few opportunities to use language knowledge in different contexts	No evidence
CONTENT KNOWLEDGE APPLICATION	Frequent opportunities to use content knowledge in different contexts	Some opportunities to use content knowledge in different contexts	Few opportunities to use content knowledge in different contexts	No evidence
USE OF LANGUAGE SKILLS	Integrate at least three language skills during the lesson.	Integrate at least two language skills during the lesson.	Integrate at least one language skill during the lesson.	No evidence

ENGAGEMENT	Students totally engaged with the lesson	Students sometimes engaged with the lesson	Little engagement during the lesson	No engagement.
PACE	Appropriate to students' ability levels	Generally appropriate to students' ability levels	Sometimes appropriate to students' ability levels	Not appropriate
FEEDBACK	Positive, consistent, and motivating feedback; highlighting strengths and encouraging improvement.	Positive feedback; highlighting some strengths but emphasizing mistakes.	Poor feedback. Only focused on mistakes	No evidence
CONTENT CONCEPT REVIEW	Evident wrap up. Accurate consolidation of learning	Good attempt to review and consolidate learning.	Poor consolidation task	No evidence
ASSESSMENT	Activities during the lesson provide good opportunities for assessment.	Some activities during the lesson provide opportunities for assessment.	Few activities during the lesson provide opportunities for assessment.	No evidence

Appendix 5

OBSERVATION TEMPLATE

<table>
<tr><td>DATE:
PLACE:</td><td>OBSERVER:</td><td>TEACHER
OBSERVED:</td><td>GRADE:</td></tr>
<tr><td colspan="4">MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT</td></tr>
<tr><td>CONTENT
OBJECTIVES</td><td colspan="3">SCORE:

COMMENT:</td></tr>
<tr><td>LANGUAGE
OBJECTIVES</td><td colspan="3">SCORE:

COMMENT:</td></tr>
<tr><td>CONTENT
CONCEPTS</td><td colspan="3">SCORE:

COMMENT:</td></tr>
<tr><td>SUBJECT
VOCABULARY</td><td colspan="3">SCORE:

COMMENT:</td></tr>
</table>

KEY VOCABULARY REVIEW	SCORE: COMMENT:
EXPLANATION OF CONTENT	SCORE: COMMENT:
PERSONAIZATION OF CONTENT	SCORE: COMMENT:
SCAFFOLDING	SCORE: COMMENT:
COMMUNICATION LEARNER/ LEARNER	SCORE: COMMENT:

COMMUNICATION TEACHER / STUDENT	SCORE: COMMENT:
STUDENT'S TIME TO RESPOND	SCORE: COMMENT:
MATERIALS AND RESOURCES	SCORE: COMMENT:
LANGUAGE KNOWLEDGE APPLICATION	SCORE: COMMENT:
CONTENT KNOWLEDGE APPLICATION	SCORE: COMMENT:
USE OF	

LANGUAGE SKILLS	SCORE: COMMENT:
ENGAGEMENT	SCORE: COMMENT:
PACE	SCORE: COMMENT:
FEEDBACK	SCORE: COMMENT:
CONTENT CONCEPT REVIEW	SCORE: COMMENT:
ASSESSMENT	SCORE:

	COMMENT:

Appendix 6

Interview 1

Question		Purpose
1.	How long have you been teaching mathematics?	Determine teacher's experience teaching mathematics.
2.	How long have you been teaching at GLC?	Learn about experience at GLC.
3.	What do you know about CLIL?	Identify how familiar teachers are with CLIL.
4.	Which CLIL activities do you usually implement in class?	Answer research question 1: What current methodology do primary math teachers at GLC implement to develop their lessons?
5.	What language aspects do you teach in your math lessons?	Answer research question 2: How is general language focused in current math lessons at GLC's primary level?
6.	How do you introduce academic or subject vocabulary to your students?	Answer research question 3: How is subject academic language being focused in current math lessons at GLC's primary level?
7.	Do you implement any strategy to improve general communicative skills in your math lessons? Which?	Answer research question 2: How is general language focused in current math lessons at GLC's primary level?
8.	How do you teach the math content?	Answer research question 4: How is content focused on in current math lessons al GLC's primary level?
9.	How do you know your students are learning the content?	Answer research question 4: How is content focused on in current math lessons al GLC's primary level?
10.	How do your students use conversation skills to communicate between them in a current lesson? Do they speak in English or in Spanish to plan or develop a task?	Answer research question 2: How is general language focused in current math lessons at GLC's primary level?
11.	Do you find CLIL as a useful tool to teach math?	Teacher's perception about CLIL

Appendix 7

Interview 2

Question		Purpose
1.	How do you deal with the grammar and the general vocabulary when the students have to read and solve a problem?	Answer research question 2: How is general language focused in current math lessons at GLC's primary level?
2.	At any moment do you stop your math lessons to teach some grammar in order to help your students understand word problems?	Determine scaffolding in terms of language support. Answer research question 1: What current methodology do primary math teachers at GLC implement to develop their lessons?
3.	How do you deal with general vocabulary when sometimes you find it as a difficulty for understanding, especially when solving word problems?	Determine scaffolding in terms of language support. Answer research question 1: What current methodology do primary math teachers at GLC implement to develop their lessons? Answer research question 2: How is general language focused in current math lessons at GLC's primary level?
4.	Some outcomes in the program ask students to do some specific tasks that are more related to language; tasks such as describing shapes or angles, or making general statements. Do you teach your students how to describe or how to make these statements previously?	Find matchings between the curriculum and the teachers' experience in the classroom. Answer research question 4: How is content focused on in current math lessons al GLC's primary level? Answer research question 3: How is subject academic language being focused in current math lessons at GLC's primary level?
5.	Do your students create their own problems? How?	Discover how students carry out challenging tasks and how teachers support them in terms of language. Answer research question 4: How is content focused on in current math lessons al GLC's primary level?
6.	What do you evaluate when the students create their problems? Do you evaluate only the content or do you also evaluate the use of language?	Answer research question 1: What current methodology do primary math teachers at GLC implement to develop their lessons?

Appendix 8

Template for interview transcript

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW :
Universidad del Norte
Date:
Time:
Interviewer:

Turn	Participant	Participation	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Appendix 9

Template for curriculum analysis

RESEARCHER:	SCHOOL:	SUBJECT:	TERM:	GRADE:
STANDARD		COMMENT:		
BENCHMARK		COMMENT:		
CONTENT OBJECTIVES		COMMENT:		
LANGUAGE OBJECTIVES		COMMENT:		
CONTENT CONCEPTS		COMMENT:		
SUBJECT VOCABULARY		COMMENT:		
LANGUAGE SKILLS		COMMENT:		
SUGGESTED METHODOLOGY		COMMENT:		

Appendix 10

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 1- Betty (B)
Setting: Aspaen Gimnasio los Corales
Date: September 4, 2015
Time: 10:45 am
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Good morning Betty.	Ice breaking
2	B	Good morning Diana	
3	D	How are you today?	
4	B	Fine, thank you.	
5	D	Well, this interview is just to collect some information about your methodology in the class, how you feel about CLIL, so I hope you could give me a lot of information for my work.	Introducing the purpose of the interview.
6	B	Ok.	
7	D	Well, how long have you been teaching mathematics?	
8	B	Ah, I've been teaching math since… ah… like six years because I have… this is my fourth year here and two years more.	Plenty experience teaching math
9	D	So you have been…	
10	B	I have six years teaching math	
11	D	You have been teaching mathematics for six years and four years in Corales	She has experience teaching at GLC.
12	B	In Corales.	Most of her experience at GLC
13	D	Ok, what do you know about CLIL?	
14	B	Ok, CLIL is the methodology we use here, ah… that well, Cambridge teaches and is content language integrated learning. We have to use it, we have some stages we can use in the class, so it could be more fun, and more student ah…activity during	Some knowledge about CLIL. Relates CLIL with Cambridge. Recognizes some stages in a CLIL lesson.

		the classes, so I like it very much.	
15	D	Ok, which CLIL activities do you usually implement in class? One that maybe you frequently use.	
16	B	Normally, I always start the class with a motivation so that children engage with the learning and with the topic, then we can have different types of activities, for example scaffolding, or hot seat, or we can also do…ah… we can play with the ball and throw it and say answers or we can have activities with a lot of manipulatives that we have here in school and that let children experiment while they are learning , we also have activities and like a close up of the class, so they can ah… understand, or go, or finish the class understanding what they learned.	Recognizes some CLIL strategies such as motivating activities for engagement, scaffolding, and consolidation activities. Mostly identifies CLIL as fun activities for learning.
17	D	Ok, what grades are you currently teaching?	
18	B	In this moment … I already teach in the fifth grade of primary, but this year I'm teaching second and third grade math	Changed from teaching big students to little students.
19	D	Ok, fantastic! What language aspects do you teach in your math lessons?	
20	B	Yes, it is very important the vocabulary, the math vocabulary, because ah…every math lesson has a vocabulary that is inferred, you can say like that, in the lesson, so it's important for them to manage the language, so they can understand problem solving, they can understand when they are asked to do something, the instructions, and it's very important to manage the language. Normally the vocabulary of the lesson. Every lesson has a different vocabulary so we learn about that vocabulary.	Understands the importance of subject vocabulary in order to understand problems and solve them. She learns and teaches subject vocabulary.
21	D	Ok. By the way, how do you	

		introduce the new academic or subject vocabulary to your students?	
22	B	Ah, we can do games, we also have the glossary, the notebook of vocabulary, we use it, and with the same motivation that we do every day we can also cover the vocabulary.	Introduces vocabulary through games and glossaries. The students write new vocabulary in a notebook.
23	D	Ok. Do you implement any strategy to improve general communicative skills in your math lessons?	
24	B	Well, normally when it's students' talking time, you let them communicate using the math vocabulary, or if you see that they have difficulties with that, you can implement different strategies ah… like games, like we talked later, or for example filling in the blanks, or things that they have to use the vocabulary to communicate with other friends, maybe in pair work or in group work, they can also implement strategies of communication.	She understands language skills as using subject vocabulary to communicate with others, probably for academic purpose. No clarity about functional language.
25	D	Ok. How do you usually teach the math content? itself	
26	B	Ok, normally the math content starts with a modelling, a practice doing the activity, they can also have pair work or in groups or as a whole class, but normally you start ok, with the motivation, the problem of the day, but you also have to model the exercise when you are talking about content in math.	She gives relevance to modeling as a strategy to teach the content. She uses other strategies such as the problem of the day, pair work, team work and whole class to teach the content.
27	D	Ok. How do you know your students are learning the content?	
28	B	Ok. You know that the students are learning when you assess, normally we assess every day. Every day has a different assessment. Ah, It's not only a quiz or a test; you can assess the results of every day. Every day class has a result and they can show	Understands assessment beyond summative assessment Peer's feedback as strategy for assessment.

		it to the rest of their friends, or have a peer check or check as a whole class. You know which student is doing the work right and which one not. If you see difficulties in some students you can help them scaffolding the content, so they can get to the same result.	
29	D	Ok. How do your students use conversation skills to communicate between them in a current lesson? Do they speak in English or in Spanish to plan or develop a task?	
30	B	Ok. Normally in second and third grade they are trying to speak in English all the time, sometimes they use Spanglish, they mix. That's a good moment to help them learn more vocabulary because if you, when they are using Spanish words immediately you correct them or you tell them how to do it in English, then they are learning, so they are learning how to communicate in English during the whole class.	Provides support to help the students learn new vocabulary Students use a mixture between English and Spanish to communicate No evidence of developing reading, writing or listening skills. She just points to speaking.
31	D	Ok. Do you find CLIL as a useful tool to teach mathematics?	
32	B	Yes, it's a very useful tool because it help you be more dynamic in the class and I think that children learn more when the class is divided in different stages and they have…and they can learn by doing what they are, what they are…what we are teaching. It's not like the teacher talking all the time, but it is a lot of student participation and student talking time and they learn like that.	Recognizes CLIL as a useful tool for teaching mathematics. Recognizes that CLIL is a learner centered methodology.
33	D	Well, ok Betty. Thank you so much!	
34	B	Thank you.	

Appendix 11

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 1- Glory (G)
Setting: Aspaen Gimnasio los Corales
Date: October 5, 2015
Time: 1:30 pm
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Good afternoon, today is October the fifth, 2015. Here I am with Glory. How are you Glory?	Introducing Glory
2	G	Fine thank you.	
3	D	Ok, Glory, I have some questions I want to ask you bout CLIL and your experience with this approach	Introduce the purpose of the interview
4	G	Ok	
5	D	How long have you been teaching mathematics?	
6	G	Ok.	
7	D	Well, how long have you been teaching mathematics?	
8	G	Eh, well, I've been teaching mathematics like eh…five? Six? Five years ago I have been teaching mathematics, but this year I am like focused on as a teacher, not as an assistant, because I have, well I was working as an assistant teacher.	All her experience teaching has been as an assistant.
9	D	Ok, how long have you been teaching at GLC?	
10	G	No, two months.	Little experience at GLC
11	D	Two months only, very good. Do you know something about CLIL?	
12	G	Eh… yes, I am like getting to use to know about CLIL. I know that it is a methodology that works a lot with context, eh… with like eh… bringing what the girls are…daily lives problems, so that they can help them	She is familiarizing with CLIL. She has some notions on CLIL and relates it with context and daily life problems.

		solve it.	
13	D	Ok. Do you implement any type of CLIL activity in your math lesson?	
14	G	I try, I try because since they are little girls, it's a little bit hard like even to speak in English and make them understand completely the different instructions.	She finds difficult to implement CLIL in her class.
15	D	Ok. Could you describe maybe a specific activity in which you think you are using CLIL with them, no matter the language?	
16	G	Eh… well… eh… in problem solving, just I always give them daily life problems, like if I have two butterflies and another butterfly flies away… some things that are very common for them.	Still relates CLIL with real life problems.
17	D	What language aspects do you teach in your math lessons? Or do you teach something related to language in your math lessons?	
18	G	Yes, I try…eh… very specific like words, addition, subtraction, taking off, adding, like make them used to that type of language.	Attempts to help the students use some subject vocabulary.
19	D	It's more the academic language.	
20	G	Aha.	
21	D	Ok. How do you introduce academic or subject vocabulary to your students? I mean you are speaking about those words that are about the subject; do you have any special strategy to teach them those new words in order to learn them?	
22	G	I maybe show them what the different meanings of the word are. If I am asking if I am working with taking off, I draw the sign, I show them what it does taking off mean or subtraction, addition, the different vocabulary used in mathematics.	She helps students make associations of key vocabulary with mathematical signs.
23	D	So you try to show them the words so they understand…	
24	G	Aha, that they associate	

25	D	Oh, so they can associate. Ok. Do you implement any strategy to improve general communicative skills in your math lesson? I mean remember that the communicative skills are four: listening, speaking, reading, and writing, so do implement any of those in your math lessons?	
26	G	I think like vocabulary. That vocabulary I think that has to do with listening and speaking, cause the idea for little girls, six and seven years, is for them like to get used to the different words they have to use according to each subject, in this aspect math.	Provides vocabulary support to foster listening and speaking.
27	D	So which of the four skills do you think you use the most? Do they read more or do they speak more? Or do they actually write in mathematics? Or do they do any type of listening?	
28	G	I think that listening and speaking cause they, they, they don't produce in writing, but they copy what I write; but they are writing, but not producing and I think that writing has to do with what they produce, so that's why I think that speaking and listening.	Recognizes speaking as the skill more developed in the math lessons.
29	D	Ok. Thank you. How do you usually teach the math content? How do you introduce the content to the girls, or do you have any special activity you could share with me which you say ok, this is the one that I frequently use when I am teaching the content?	
30	G	Well, in addition and subtraction that are like the things right now that I want to reinforce in the girls, eh… when we are gonna do math, addition or subtraction problems, I make them work with blocks, or counters, or bring them candies and show them	Uses manipulatives or candies to teach the math content

		when what do you do when if I have seven minus five, I show them like how do you do it, and then call and then the girls do the different exercises.	
31	D	So they use candies and things they can manipulate.	Giving input to confirm information
32	G	Yes, yes	Confirming information
33	D	And after that they eat their candy.	
34	G	Yes.	
35	D	Ok, good. How do you know your students are learning the content? What is the evidence maybe that you could say, ok the evidence is this. They are learning because…	
36	G	Because when for example in that activity I just told you, they feel motivated and they want to do it and when I call them, like one by one another girl wants always to help the other one. I used…I see them like using their fingers and wanting to participate or just making a word problem or an exercises in the notebook or in the book, so I think that is the evidence that I'm using right now.	Recognizes motivation as an indicator of learning the content.
37	D	So, you see them motivated, working,	Input to confirm information
38	G	Yes	Confirming information
39	D	Participating	Input
40	G	Yes	Confirming information
41	D	Ok, I know that your students are really little, you know? So, but how do you think they communicate when they have to maybe work in groups, when they have to solve a problem, or a task you assign them; so how do they communicate? Do they use English or do they do it in Spanish?	
42	G	They use English and I always motivate them to use English because that's the principal idea for	Declares that her students speak in English all the time.

		them to get used to the vocabulary and use it, and understand that they can use it, so I think that, well almost all the time they use English.	
43	D	But do they speak English between them?	Asking to confirm information
44	G	Yes	Confirming information
45	D	Between the girls?	Asking to confirm information
46	G	Yes	Confirming information
47	D	Ok. Do you find CLIL as a useful tool to teach mathematics?	
48	G	I think it's useful. Maybe I'm not like used to too much because I have like to know a little bit more and look for more ideas, but it's very useful because it's like, osea it's like reality and it makes mathematics more tangible for them, for the girls.	Finds CLIL as a useful tool to ease math learning.
49	D	Ok. Well, thank you for your time.	
50	G	No, thank you.	

Appendix 12

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 1- Patty (P)
Setting: Aspaen Gimnasio los Corales
Date: September 17, 2015
Time: 2:40 pm
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Ok, First of all thank you for this interview Patty…and so, I wanna you to answer a couple of questions about CLIL and how you implement it in the classroom. How long have you been teaching mathematics?	Introduction of the purpose of the interview.
2	P	I've been teaching math…umm…since 2007, so eight years more or less	Plenty experience teaching math
3	D	And how long have you been teaching at GLC?	
4	P	The same time… eight…I starting my ninth year, really	All her experience at GLC.
5	D	Ok, so your experience has all been here at GLC.	Asking to confirm information.
6	P	Yes	Confirming information
7	D	Ok, what do you know about CLIL?	
8	P	It's a methodology that is used in many schools around the world and it's used…em…because it helps…ah …students to be more …em…I forgot the word… how do you say when they are sure about they do…	Recognizes the importance of CLIL in the world.
9	D	Confident	
10	P	Confident! That's the word! Ok, confident, also because it makes the class more dynamic and we can do	Recognizes CLIL as a methodology which fosters confidence in the

		many activities, ah…we can use many strategies, eh…also because the learning is focused on the students and not on the teacher, so it helps a lot.	students Recognizes CLIL as a learner centered methodology with a variety of teaching strategies.
11	D	Ok, which CLIL activities do you usually implement in class?	
12	P	First of all because we manage the stages of the class, so it has a warm up, it has a model activity, then we have an activity that is done by the students depending, probably individually, probably in groups, probably they have to go around, eh… some of them think they are games, but they are not really games; they are learning in a different way. Som…Most of the time they check between them or in groups or the teacher goes around and at the end there is feedback of the activity.	Emphasizes some stages of the class: warm up, students work either independent or group work, and peer's feedback. She did not mention consolidation of learning.
13	D	Ok, What language aspects do you teach in your math lessons?	
14	P	We don't only teach the subject vocabulary words that are …of the subject, I mean for example in math, we have the plus, minus, times, those are words related to the subject, but when we are speaking English and the girls have to answer in English and they are talking between them, we…ah, if they are for example, they are telling something to another student or to the teacher and probably they use an incorrect tense of the verb or something like that, we have to tell the girl the correct way and probably the girl has to repeat, so we are not only teaching math but also like language arts in another way, but we are teaching language arts using math, for example.	Focuses language in language through learning. She mostly gives input to the students to learn vocabulary or grammar when it is required at the moment of speaking. There is no planning of language activities.

15	D	Ok, how do you introduce the academic or subject vocabulary to your students?	
16	P	Well, usually I eh… make some, some, make some cards, in some cards I have…em… definitions and on the other cards sometimes I have examples, and other cards I have the vocabulary, so I give each girl a card, ok? So, I give them time to go around the classroom and try to match the word with the definition and the example. Probably they have some prior knowledge, probably not, but just to try out to see what happen; then we check, but we try to relate the word with something they already know, so that we can build up the definition of the words, eh… the vocabulary words we are going to teach	Introduces subject vocabulary by matching words, definitions and examples. Relates prior knowledge with new vocabulary, and then the students build up meaning of the new words.
17	D	Ok, that sounds interesting. Ok. Do you implement any strategy to improve general communicative skills in your math lessons?	
18	P	I was telling you that, that when they are working, sometimes they work individually, probably when they finish the activity they have to peer check or when they are working in groups they have to talk among them to come up with an answer or if they are solving a problem they have to come up with a reasonable answer and to explain what they did, so I think they are always communicating between them and they have to communicate what they did to the whole class.	Math lessons mostly foster speaking. Patty did not mention reading, writing or listening as possible skills to develop the learning of the content.
19	D	Ok. How do you teach the math content?	
20	P	Eh… well, using the methodology…the CLIL methodology we are teaching	She mentioned that she uses CLIL to teach the content of mathematics

		content, I mean the class is dynamic, we are doing different strategies, we have different activities, but I have a content that I have to teach, so eh… for example vocabulary, that is content of the subject, I already told you how I do it, so in that way. Sometimes, I try not to do it too much, but I have to explain a class and I have to explain something that sometimes when they do this type of activities that they have to come up with an answer, they have to come, sometimes they are not so clear, so I have to explain. We have a text book that is really good and all of them have the explanation, they have a lot of problem solving, they have definitions, they have pictures a lot of pictures, so… and they have to write also in the notebook also, and some activities are done in the notebooks, some are done in worksheets, some are done in the textbook, so they have a lot of, but it's good.	but she did not mention any concrete CLIL strategy to teach the content. Patty basically explained that she works vocabulary, explains the content, work in the text book (which she considers a very good tool), the notebooks or worksheets.
21	D	So, when you teach content you're basically using other skills such as reading, writing…	Input to find out more information.
22	P	Yes	
23	D	Speaking, do you use listening?	Input to find out more information.
24	P	li… no…well, listening, when they speak among them, because, or when they listen to the teacher, for example, and also because when they are speaking among them in groups, they try to speak Spanish, not in English, so when the teacher goes around to check what they are doing, (whispering) "girl but you have to speak in English", ok, so that is another way for them like to improve the English speaking.	Listening only takes place during the interaction teacher/student or student/student Patty encourages the students to speak I English.

25	D	How do you know your students are learning the content?	
26	P	Well, first because at the end of each lesson or each class, we have a feedback, at the end of the lesson or at the end of a class, we must have a feedback. Sometimes it's the whole class, I mean orally, sometimes teacher can say "take your notebook" the teacher means something related to the class, write it on the board, whatever, and they have to show the notebook, or the teacher can select or choose somebody to tell the answer, to share the answer to the students, but before that, they have to share answers among them or in groups, or peer check, or whatever, so in that way, I know they are learning	Teacher or peer's feedback is patty's evidence of learning the content.
27	D	They are learning. So you assess them all the time.	Input to confirm information.
28	P	Yes	Confirming information
29	D	Ok. So, you were mentioning before that sometimes when they are planning, or they are working together, they attempt to speak in Spanish and you…	
30	P	Specially the lower grades	Confirming information
31	D	Ok, the ones who are eh… lower performance, ok, ah… how do you control the use of language when planning or solving a task or working in a problem?	
32	P	As I told you, usually I go around the classroom to see what they are doing, as I told you, lower grades especially they always try to speak Spanish when they are in groups, so we go, I go around, and they ask me, sometimes in Spanish because they are talking in Spanish, so they Miss!… and they ask me whatever in Spanish, so then "what?" "Miss you don't understand" "what?"	Patty encourages the students to speak in English during the lesson.

		"Ah… ok", they tell me in English, and in that way, the other girls in the group, if they want to ask something, they do it in English, because this girl asked for in Spanish and I told her not to do it…eh… but it's difficult for the girls who are in lower grades	
33	D	Do you think it's bad at all to use Spanish maybe for those cases?	Inquiring more information
34	P	Sometimes I let them do it, ok? Sometimes, but when I know, they can´t do it, but when I go to that group, I tell them to speak in English, but I, If I'm not there, I just see them and they are all speaking Spanish, but when I get there, I try to tell them to speak in English	Encourages use of English in class.
35	D	Sometimes they need, in order to understand what they're going to do, sometimes especially in mathematics, instructions could be difficult for them if they don´t know the language very well, so eh… probably that's why they use to do it. Ok, and when they present the task, do they do it in English?	
36	P	When they present the task, yes; when they present task must be in English, they cannot stand in front of the class or do any presentation in Spanish. I mean the time to speak Spanish if they want to is when they are in groups, between them or among them, but when they are going to present or they are going to pass to the front or to do something on the board, they must speak in English, I mean sometimes they don't know how to say a word and they ask in Spanish how to say the word in English, but they have to repeat the whole sentence again and say it.	Patty allows them to use Spanish when they are working in groups, between them, but it is a must in Patty's lessons to present work in English.

37	D	So, they are constantly improving general language through asking how to say in English and that.	Confirming information.
38	P	Yes, that's right.	Confirming information.
39	D	Ok. So, do you find CLIL a useful tool to teach mathematics?	
40	P	Yes, not only mathematics, I use CLIL in science and in other activities also. I think that it's useful because it helps us manage time, I think, and also to have all the students like "busy" every stage of the class; they have no time like to go…obviously there're some girls that are moving sometimes, are moving around, they want… because not all of them learn in the same way; some of them want to be walking, the other ones want to be sitting down; different, but I think this CLIL methodology helps them like to have them working at every stage of the class, so I think it's very useful.	Patty finds CLIL useful for teaching mathematics and science. She remarks some advantages of CLIL such as time management and variety of activities that keep the students working all the time.
41	D	Ok, thank you patty, so much	

Appendix 13

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 2- Betty (B)
Setting: Aspaen Gimnasio los Corales
Date: December 10, 2015
Time: 8: 35 am
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Well, thank you for this last interview. I have some questions I want to ask you and I hope you can share your insights with me.	
2	P	Ok.	
3	D	Ok, how do you deal with grammar and vocabulary when your students have to solve problems, when they have to read them?	
4	B	First, when I am with the small girls, seven /eight years old, I have to scaffold the problem because you have to divide it by steps, so they can know how to solve the problem. Normally, if they don't understand the vocabulary, you would go step by step and reading again and making them understand scaffolding the steps or the procedure, so they can… and other thing that helps them is to model, first an example of a problem that they have to do and they can do it by themselves.	Scaffolds word problems to help the students understand vocabulary Models with an example to help the students read word problems.
5	D	Ok, Betty have you ever stopped the lesson because you want to ask your students to read a problem and you realize that there is some grammar that they probably don't know. Have you ever stopped the lesson to explain that grammar?	
6	B	Yes. A lot of times. For me it's easier because I teach also English,	Explains some grammar in the math lesson when

		so sometimes I can do projects and at the same time I know that I'm explaining in English how to ask questions for example, so I can connect it to math and work together, but I have to stop, because when we are doing math problems, it's not only the grammar, but the vocabulary they use, so we have to explain the girls the meanings, sometimes we have to use the glossary of the book or dictionaries, so they can understand the meaning of some words that are new for them. We also write these clue words when they have… for example clue words for additions, clue words for subtraction; we write them like in a vocabulary notebook we have and the structure of the problem, the grammar, you have to explain it so they can identify what kind of question you are asking, so we have to stop and make these corrections and these adjustments so they can understand.	required. Works projects with language arts to support language. Uses dictionaries and glossaries to teach vocabulary and teaches clue words for different operations as language support to solve word problems.
7	D	I was going to ask you about vocabulary. Yes, general vocabulary sometimes influences for understanding because there are words, maybe no content, but words that don't let them understand the problems, so you basically ask them to look for the dictionary, or you give them…	
8	B	Or in the glossary of the book, normally they have the meanings of these math words, of this content vocabulary.	Uses the glossary in the math book to teach subject vocabulary.
9	D	What about those words that are not math words? For example, I don't know daughter.	Asking for more information
10	B	Yes, those words are like clue words for the problem that are not in the glossary. We also explain them in	Only refers to explaining the meaning of new words in the

		class if they are having difficulties with them. And when they don't understand some words we make them write them in a notebook that is the vocabulary notebook… ok, all the words that you don't understand, you will write them there so we go and we explain the words.	vocabulary notebook. Context clues should be implemented.
11	D	Ok. Some outcomes in the program ask students to do some specific language activities like describing shapes or angles. Second and third graders mostly have to describe. How do you teach them to describe?	
12	B	Ok. Ah…with practical activities. Normally for them it is difficult to describe because of the vocabulary they have to use, but when you model and you describe something for them it's easier, so you can… when they answer, normally you ask a question and they know the answer, but when you ask them why do you know? Explain me why, describe me a shape, or describe me something, they will start thinking, so yes, I do it in the class; mostly in geometry and in everything, because in math problems too. So, if you model how they have to write a statement, if you model them, it is easier for them to do it, so it's like helping them doing the structure of the statement.	Modeling as teaching strategy for functional language and writing.
13	D	Ok. Do your students write their own problems?	
14	B	Yes. I encourage them to write problems. It is difficult for them so you have to help them writing a problem on the board first, modeling, doing it. the first time I did it with them; I created with the whole class and I was writing on the board, but were their ideas, it was like a brainstorm, so with their ideas, I helped them to write it in a good	Encourages students to write word problems by modeling. Students write their own problems using the teacher's model. Students just limit to imitate the teacher's word problems.

		structure, so I wrote the problem in the board and then I encouraged them to write their own problem. Normally they are gonna do it using the same structure as the one that you model and it is easier for them to do addition problems. But when we were doing subtractions, if you model a subtraction problem, then they will use the same idea, changing some words and some numbers that's what I do.	
15	D	And when you evaluate, do you keep in mind also that the problem is well written, the grammar is ok, or you don't pay attention to that?	
16	B	Yes, because when I check these problems I am evaluating the structure, the words they are using, if the questions they are using are right for an addition or a subtraction, so that's part of what you are teaching, helping then on what is the structure and the words that they have to use in the problem, so when I am checking, I use them, I am checking that.	Evaluates language when assessing writing word problems.
17	D	Well, thank you very much.	

Appendix 14

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 2- Glory (G)
Setting: Aspaen Gimnasio los Corales
Date: December 10, 2015
Time: 1:30 pm
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Hello Glory. Thanks for your disposition and thanks for accepting this last interview. I will ask you some questions in order to find out about some aspects I wish you share with me.	
2	G	No, you're welcome	
3	D	Well… you have the little babies, the smallest in primary. How do you deal with word problems when they have to read… well of curse they also have grammar and a lot of vocabulary that they don't know. How do you help them understand the word problems?	
4	G	Well, I like to use pictures and drawings because it's the way for the students to associate, and while the time goes by, like changing the strategy, not using pictures but just like with the word, explaining what do the words mean and scaffolding is a very important strategy when you working with little kids	Uses drawings and explains the meaning of new words to help students understand word problems.
5	D	With little kids it is even more complicated to help them understand the purpose of word problems. Have you ever stopped your lesson to explain some grammar content in order to help your students understand word problems?	
6	G	I have to stop. If not you are not	Glory stops the lesson

		teaching them like everything all together and I'm the only teacher, I mean I teach almost all the subjects, so I think it's very important to stop and go back and see if they understand and what this or that word means. If not, you are not teaching everything as a whole thing.	to explain grammar to the students to improve understanding.
7	D	And how often do you do that, how often do you stop your teaching and you say "ok this is the grammar that they don't know" or do you support that with other subject? How do you deal with that?	Confirming information
8	G	No, I think that I do both; I stop and I support it with the other subjects. You have to stop to teach them the vocabulary or to teach them something they don't understand.	Supports grammar with other subjects.
9	D	Your little kids are actually learning how to write. However some outcomes in the program ask students to do some language activities which mostly involve description. So when they have to describe shapes, (that is basically what I saw in your program) how do you help them to do those descriptions?	
10	G	No, the first step for description is observation, so with observation, looking for the adequate words, what do they see? What do you feel? What do you hear? Through observation is like the first step for them to learn how to describe. I'm just like giving them the clues or the keys for the words to use for that specific shape or size.	Glory asks students to observe and supports them with clue words to help them learn how to describe shapes.
11	D	Ok. Glory, do your kids write word problems? How do they make it?	
12	G	I try, I try, I begin modeling and I think that maybe the goal at the end of the year is for them to create simple ones, simple word problems	Students still do not write word problems.

		because they are trying.	
13	D	You mentioned before that you usually use pictures to help them understand word problems, do they use pictures to write their own problems.	Input to confirm information
14	G	Yes, yes. They use the pictures to explain the word problems, it's better, or use the material, they touch it they work with concrete objects.	Drawings and manipulatives to make own problems
15	D	Ok, Glory. Thank you so much.	

Appendix 15

"CLIL as a tool to fulfil mathematics content and language needs at primary levels: a case study at Aspaen Gimnasio los Corales"
INTERVIEW 2- Patty (P)
Setting: Aspaen Gimnasio los Corales
Date: December 10, 2015
Time: 10:45 am
Interviewer: Diana Pérez Alvarez (D)

Turn #	Participant	Participation	Comments for analysis
1	D	Well, thank you for this last interview. I have a couple of questions I want to ask you and I hope you can give me some of your experience regarding the following topics.	
2	P	You're welcome.	
3	D	Math problems not only have content specific vocabulary, but grammatical structures and general vocabulary. How do you deal with the grammar and the general vocabulary when the students have to read and solve a problem?	
4	P	Well, we have to keep in mind grammar because they are learning mathematical problems, but they also are learning English in Math; so if they have to know the structure of a sentence, the structure in a paragraph, if what they are asking is what they really want to know. So in the same time we are dealing with both things: English and math at the same time…and vocabulary, if there is any word that they don't know, we usually use a glossary in the math book, or if there is another word that is not a math word, we also use, not a glossary but another dictionary, probably that they use in English or	Uses the glossary in the math book to teach subject vocabulary, and the dictionary for general vocabulary. Should use context clues to infer meaning of new words.

		in another subject. So we use dictionary, not only in math but in any other subjects, but in math, usually the math glossary that we have at the end, at the back of the book.	
5	D	Ok, well… at any moment do you stop your math lessons to teach some grammar in order to help your students understand word problems?	
6	P	Yes, in some cases we stop the lesson, and, for example if they are writing a problem, and when they are writing the problem they use the … I mean the structure they need to ask a question or to make out the problem, we have to go back and explain to them how to start a problem, the steps they have to follow, or probably what question do they have to ask because probably they are talking about… I don't know… for example students in the school and sometimes their questions is something different from what they are writing, so it's very important to go back and explain to them that everything has to be related. They cannot write something that is at the beginning of the problem that is different from the question that they are asking at the end.	Explains structure and style required to write word problems, checking agreement, cohesion and coherence of the word problem.
7	D	Ah, well you mean when they are writing their own problems.	
8	P	They have to write, they have to write, yes. But obviously at the beginning I have to model and then they do it, but when they start doing problems, they start, but they always want to write addition problems it's like difficult for them to do a subtraction problem, or	Encourages and supports the students to write complex word problems.

		sometimes multiplication or division. The easiest one for them are addition problems, but I mean they start writing, but when they have to write the question or to say then question, it is difficult for them like to start the question. Sometimes they don't use "what", "where", "when"… they just write a sentence, so that's when we have to help them to do it.	
9	D	Yes, but what you mean is when they have to write their own problems. But what about reading, reading a word problem. Have you ever maybe stopped a moment of the class to see…ok this is a grammatical structure that they don't handle yet, so I will stop here, teach them this here and then I will ask them to read the problem again. Have you ever done that?	
10	P	Yes, because you know as when we are going to solve a problem we go by steps. So when we are going to do the steps, we stop even though if, for example, if this sentence is a sentence that they understand, but if not, because probably they don't know that grammatical structure, so we stop, we explain and then we go to the second step of the problem. Probably it's to know the words that they don't know, the unusual words for them, for example, I mean to solve the problem we have to go by steps, and if there is a grammatical structure they don't know, we have to stop every time because they need to know what to do.	Explains grammar only when it is a difficulty to understand word problems.
11	D	How do you deal with general vocabulary that it's not maybe the content vocabulary, and you find it sometimes as a difficulty for	

		understanding word problems?	
12	P	Well, sometimes for example there are some words that some girls don't know the meaning, but some other yes, for example if you say a word like "daughter". You ask "do you know what daughter means" "no, I don't know" or a girl says yes I know, well ok what is daughter? And that girl tells me the meaning ok. Or probably she says something that is related, so I start like asking the other girls what do they think daughter means, so in that way we build up the meaning of the word. Or if not, sometimes we use a dictionary, or … the first thing that I do is like to do is build up the meaning with all the girls, with all the students and then, that is the last, the last thing I do is to take the dictionary look for the word and look for the meaning. And in that way we solve the difficulty in that moment, but most of the times they can find out the meaning, context clues they use other words in the paragraph that they can find the meaning of those unusual words.	Uses strategies such as asking for students' prior knowledge, dictionaries or context clues to learn the meaning of a new word.
13	D	Well, some outcomes in the program ask students to do some specific tasks that are more language activities such as describing shapes or angles, or making general statements and even fifth and sixth graders are asked to explain processes. Do you teach your students how to describe or how to make these statements previously?	
14	P	Yes, and we have to do it, because for example it is not only to say, this is an example "a triangle"; ah it's a shape that has three sides…	Provides input by using questions in order to help students carry out challenging tasks such as

		and what else? Three angles. And what else? What can you say? Or probably we can say "is it a quadrilateral? Is it a polygon? You have to compare those shapes with other types of shapes to see, and then they can say is it the same type? No, it's not the same type… I mean to say everything about the shape. Is it a shape that probably is a rectangle, a square, a trapezoid; all those are quadrilaterals and what is the difference between those shapes and for example a hexagon; or what is the difference between that and a triangle? And why, if they are quadrilaterals the trapezoid different from those, so and they have to say everything for example if the shapes have parallel sides or perpendicular lines… they have to describe the shape but in all the ways they can, and it's really important because when they are like in third, fourth grade they only say how many sides and how many angles. As you go on, in fifth and sixth now they have to use parallel lines, perpendicular lines, types of angles: if it is acute, obtuse, or other angle, so as you go in higher levels you have to go deeper in the topic. For examples girls in sixth and seventh grade, usually they do charts or tables in which they have to write sides, angles, if they have parallel sides, opposite sides, if the angles measure the same… I mean when you go to higher grades, you have to go deeper in that, but they have to describe shapes, and to contrast and compare shapes.	describing the properties of a shape. Use graphic organizers to scaffold content.
15	D	Ok. Do your students create their own problems?	
16	P	Yes. They have to create their own	Models word problems

		problems. Usually we model a problem and then they have to create their own problems. Usually they use like the same structure we use to write… the same words, they just change, for example if I use cows, they use sheep and the other ones use dogs, but usually they use the same structure. And also, usually as I told you, they only want to write addition problems; it's easier for them, but we have to encourage them to write problems using subtraction and division because they always want to write addition or multiplication problems. So, sometimes we are only working for example subtraction and you tell them to create one and they create one using addition and we are just working subtraction, because it is easier for them. But they, the first thing, especially when they are in fourth, third grade, fourth grade, fifth grade, they use the same structure that you used. In other levels, in higher levels, probably sometimes they change; but they have to do it. Every time we are working solving problems they have to create their own problems. Sometimes they work alone, by themselves; I mean alone or in groups, but I prefer by themselves.	for the students; when the students make their own problems, they mostly take the teacher's model and make minimal changes.
17	D	And what do you evaluate when they create their problems? Do you evaluate only the content or do you also have into account the language they use? If it is well written, if the grammar is ok, the spelling is ok.	
18	P	Yes, I check everything, spelling, grammar and the structure, but sometimes, the structure… I mean if the problem is correct and it	Patty evaluates language as well as the content when assessing word problems; however she

		makes sense and the question is correct, for me it's a good problem. The thing is that I have to go back and tell the student that probably the question has to start with what or how many or whatever, but probably the problem is well done, so I go back to that girl, to the student and sit together and tell the student that probably you have to start first with a sentence telling what you are going to talk about, then you give the information and then you ask. So every time they write, I have to go back.	gives more relevance to content than to language.
19	D	Thank you for your time.	
20	P	You're welcome.	

Appendix 16

OBSERVATION 1

DATE: 24/09/15 PLACE: GLC 1st grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: GLORY	GRADE: 1ST
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Implicit: can be inferred throughout the development of the lesson		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: No evidence of language objectives. The teacher mainly asked students to read addition sentences.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 0		

	COMMENT: there was no evidence of emphasis in subject vocabulary during the class. Probably it was introduced in other lesson because the students were familiar with numbers and the names of the signs plus (+) and equals (=).
KEY VOCABULARY REVIEW	SCORE: 0 COMMENT: There was no review of key vocabulary at any moment of the class.
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities.
PERSONAIZATION OF CONTENT	SCORE:1 COMMENT: Little connection to the students' context. The problems were mostly taken from the book. The students found some relation with their reality when they were using the counters and when they were playing with the cards.
SCAFFOLDING	SCORE: 3 COMMENT: The teacher used strategies such as counting with the fingers to help the students solve additions. The teacher gave individual support to the students with difficulties to solve the problems.

COMMUNICATION LEARNER/ LEARNER	SCORE: 2 COMMENT: Some opportunities to interact and carry out tasks in groups. Visible at the end of the class.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Plenty of time to think and respond to input.
MATERIALS AND RESOURCES	SCORE: 3 COMMENT: Accurate material and resources for the age, level and learning objectives.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use language knowledge in different contexts. The students had frequent opportunities to use math language while reading addition sentences while working with the problems and when playing with the addition cards.

CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use content knowledge in different contexts. The students had frequent opportunities to demonstrate content knowledge while solving addition problems and when playing with the addition cards.
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: Integrate at least two language skills during the lesson. The students were mostly reading, writing, and speaking in response to the teacher's input in response to problems related to additions. Students mostly speak in Spanish.
ENGAGEMENT	SCORE: 3 COMMENT: Students totally engaged with the lesson.
PACE	SCORE: 3 COMMENT: Appropriate to students' ability and level
FEEDBACK	SCORE: 0

	COMMENT: No evidence of feedback. The teacher just told the students who were correct to go and play with the cards.
CONTENT CONCEPT REVIEW	SCORE: 0 COMMENT: No evidence. There was no consolidation of learning. At the end of the class there was no consolidation of learning. The class ended when the students were playing alone with the cards because the teacher was working with the students with difficulties.
ASSESSMENT	SCORE: 2 COMMENT: Some activities during the lesson provide opportunities for assessment.

Appendix 17

OBSERVATION 2

DATE: 15/10/15 PLACE: GLC 1st grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: GLORY	GRADE: 1ST
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Implicit: can be inferred throughout the development of the lesson		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: No evidence of language objectives. The teacher mainly asked students to read addition sentences.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 0		

	COMMENT: there was no evidence of emphasis in subject vocabulary during the class. Probably it was introduced in other lesson because the students were familiar with numbers and the names of the signs minus (-) and equals (=).
KEY VOCABULARY REVIEW	SCORE: 2 COMMENT: There was of key vocabulary at the end of the class.
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities.
PERSONAIZATION OF CONTENT	SCORE:1 COMMENT: Little connection to the students' context. The problems were mostly taken from the book. The students found some relation with their reality when they were using the counters and when they were playing with the cards.
SCAFFOLDING	SCORE: 3 COMMENT: The teacher used strategies such drawings to support learning. The teacher supported students according to group and individual needs.

COMMUNICATION LEARNER/ LEARNER	SCORE: 3 COMMENT: Frequent opportunities to interact and carry out tasks in groups.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Plenty of time to think and respond to input.
MATERIALS AND RESOURCES	SCORE: 3 COMMENT: Accurate material and resources for the age, level and learning objectives.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use language knowledge in different contexts. The students had frequent opportunities to use math language while working with the problems and when working in groups.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3

	COMMENT: Frequent opportunities to use content knowledge in different contexts. The students had frequent opportunities to demonstrate content knowledge while solving the problems and when working in groups.
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: Integrate at least two language skills during the lesson. The students were mostly reading, writing and speaking in response to the teacher's input regarding subtraction sentences. The listening took place during the interaction teacher/students. Students mostly speak in Spanish.
ENGAGEMENT	SCORE: 3 COMMENT: Students totally engaged with the lesson.
PACE	SCORE: 3 COMMENT: Appropriate to students' ability and level
FEEDBACK	SCORE: 2 COMMENT: Few evidence of feedback at the beginning of the class. The teacher just checked class work in the notebook.

CONTENT CONCEPT REVIEW	SCORE: 3 COMMENT: There was consolidation of learning. During the wrap-up activity, the teacher asked the students to remember what they had learned in the lesson and reviewed key vocabulary.
ASSESSMENT	SCORE: 2 COMMENT: Some activities during the lesson provide opportunities for assessment.

Appendix 18

OBSERVATION ONE

DATE: September 22nd, 2015 PLACE: GLC 2nd grade classroom	OBSERVER: Diana Perez Alvarez	TEACHER OBSERVED: BETTY	GRADE: second
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Implicit: can be inferred throughout the development of the lesson.		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: No language objectives evident		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level. Students have enough background to learn the new content.		
SUBJECT VOCABULARY	SCORE: 3 COMMENT:		

	Emphasizes words “Few”, doesn’t write a glossary of new words. The students are familiar with subject vocabulary “Extended form”, “word form”, “subtraction”
KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: Checked previous learning about tens and ones and numbers up to 100 to introduce hundreds “Who knows what is fewer?” students answer in Spanish Expanded form: students remember different ways to write a number Less to remember the concept of subtraction
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Drew diagrams on the board to introduce the new content: place value “Hundreds, tens, and ones” Supports students who require extra support. Students start adding three-digit numbers.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: Lack of connection with real life. Mostly working in the worksheet. Should use counters to help them understand.
SCAFFOLDING	SCORE: 3

	COMMENT: Scaffolds to explain a problem. Students follow the steps to solve the problem, but not all of them follow the problem. Supports students who require it. Checks everybody's work Students draw diagrams to show hundreds, tens and ones
COMMUNICATION LEARNER/ LEARNER	SCORE: 1 COMMENT: All the tasks are individual work. Students only interact between them when the teacher asks them to help someone solve a problem or clarify questions.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Teacher leads the conversation most of the time. It's mostly student-teacher interaction. Students mostly speak in Spanish Students try to explain how they solved the problem in English Students respond to teacher's input, sometimes in English (especially when speaking about numbers)
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Plenty of time to respond. Support from classmates
MATERIALS AND RESOURCES	SCORE: 3

	COMMENT: Appropriate for the level and students' age.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Students try to explain how they solved the problem using math vocabulary.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: evident during the whole lesson
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: mostly reading and speaking
ENGAGEMENT	SCORE: 3 COMMENT: Students engaged. All attempted to participate, they wanted to read, share their answers and show their work.
PACE	SCORE: 3 COMMENT: appropriate for the students' needs in class.

FEEDBACK	SCORE: 3 COMMENT: Mostly student/ student feedback. The teacher supported students' feedback by confirming or encouraging the learners identify mistakes.
CONTENT CONCEPT REVIEW	SCORE: 0 COMMENT: There was no wrap-up section at the end of the class.
ASSESSMENT	SCORE: 3 COMMENT: there were opportunities for assessment during the class.

Appendix 19

OBSERVATION TWO

DATE: November 3rd, 2015 PLACE: GLC 2nd grade classroom	OBSERVER: Diana Perez Alvarez	TEACHER OBSERVED: BETTY	GRADE: second
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Implicit: can be inferred throughout the development of the lesson.		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: No language objectives evident		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level. Students have enough background to learn the new content. Teacher checked prior knowledge.		
SUBJECT VOCABULARY	SCORE: 3		

	COMMENT: Emphasizes words “angles”, “hexagon”, “sides”, “vertices”
KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: Emphasized during the lesson.
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Plenty explanation of content: modeling, confirmed instructions, explanation in Spanish, individual and group explanation.
PERSONAIZATION OF CONTENT	SCORE: 1 COMMENT: Lack of connection with real life. Mostly working in the book. Only shown when using the paper shape to show angles.
SCAFFOLDING	SCORE: 3 COMMENT: Very well structured activities aiming at assisting and supporting students’ learning. Drawing shapes on the board, giving instructions step by step, modeling, and giving individual and group support.

COMMUNICATION LEARNER/ LEARNER	SCORE: 1 COMMENT: All the tasks are individual work. Students only interact between them when the teacher asks them to help someone solve a problem, give feedback or clarify questions.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Teacher leads the conversation most of the time. It's mostly student-teacher interaction. Students mostly speak in Spanish Students respond to teacher's input, sometimes in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Plenty of time to respond. Support from classmates
MATERIALS AND RESOURCES	SCORE: COMMENT: Appropriate for the level and students' age.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: .

CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: evident during the whole lesson
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: mostly reading and speaking. Some writing when describing the shapes in the problem
ENGAGEMENT	SCORE: 3 COMMENT: Students engaged. All attempted to participate, they wanted to read, share their answers and show their work.
PACE	SCORE: 3 COMMENT: appropriate for the students' needs in class.
FEEDBACK	SCORE: 3 COMMENT: Mostly students gave feedback to each other. The teacher supported students' feedback by confirming correct work or encouraging the students to discover mistakes. The teacher checked the students' work individually.

CONTENT CONCEPT REVIEW	SCORE: 3 COMMENT: The teacher asked about the number of angles in a rectangle, in a quadrilateral, in a triangle, in a pentagon and how many sides are in a hexagon. Students answered correctly.
ASSESSMENT	SCORE: 3 COMMENT: There were good opportunities for assessment during the class.

Appendix 20

OBSERVATION ONE

DATE: 09/29/15 PLACE: 3rd grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: BETTY	GRADE: 3RD
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson. The teacher wanted to do the chapter review: solving addition, subtraction, rounding to the nearest 10 and 100, solving word problems (P. 55 and 56), but she did not emphasized it explicitly.		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: The teacher mostly focused the lesson on reviewing how to solve subtractions by regrouping.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: The teacher was retaking concepts related to solving addition, subtraction, rounding to the nearest 10 and 100, and solving word problems during the lesson.		
SUBJECT VOCABULARY	SCORE: 1		

	COMMENT: there was no introduction of subject vocabulary, but at the beginning of the class there was review of previously learned vocabulary related to properties of addition and subtraction. Some students found the task difficult; this means they are not so familiar with it.
KEY VOCABULARY REVIEW	SCORE: 1 COMMENT: The first part of the review checked vocabulary and properties of addition and subtraction
EXPLANATION OF CONTENT	SCORE: 2 COMMENT: The teacher only explained when it was necessary (when the students had questions or did no understand how to solve a problem)
PERSONAIZATION OF CONTENT	SCORE: 1 COMMENT: There was mostly no personalization of content. It was only problems and exercises from the book. Only when the teacher gave an example to model a problem, there was a type of personalization. “You ate 2 chocolates yesterday and 3 today, how many chocolates did you eat during the two days?”
SCAFFOLDING	SCORE: 3

	COMMENT: the teacher modeled a problem and asked the students to help her explain what happens step by step. She also reviewed place value to explain regrouping. In addition, she told the students that they could use other strategies such as rounding to the nearest ten and hundred to estimate additions and subtractions.
COMMUNICATION LEARNER/ LEARNER	SCORE: 1 COMMENT: Little communication between learners. The interaction was mostly teacher/ student. The students' interaction took place when asking for help and this interaction was in Spanish. There was no team work.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Most of the communication in the lesson was teacher/student. The teacher gave instructions, gave explanation when necessary, asked and answered questions when the students required it.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: appropriate time to think and respond the task.
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: The students only used the math book. The teacher used the board to clarify questions or model problems.

LANGUAGE KNOWLEDGE APPLICATION	SCORE: 2 COMMENT: The students used language knowledge to tell the story on how to solve subtractions with the method of regrouping.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: The students constantly applied knowledge while solving the activities in the review.
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: The language skill mostly used was reading. There was some speaking during interaction with the teacher. Interaction with classmates was mostly in Spanish.
ENGAGEMENT	SCORE: 3 COMMENT: The students were engaged with the activity. No one complained while working.
PACE	SCORE: 3

	COMMENT: Appropriate for the students abilities and level.
FEEDBACK	SCORE: 2 COMMENT: the teacher gave individual feedback to the students as they worked in the review.
CONTENT CONCEPT REVIEW	SCORE:3 COMMENT: The entire lesson was a review of previous concepts.
ASSESSMENT	SCORE: 3 COMMENT: The entire lesson was summative assessment.

Appendix 21

OBSERVATION ONE

DATE: 15/10/15 PLACE: 3rd grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: BETTY	GRADE: 3RD
MARK A SCORE FROM 0 TO 3 TO REFLECT ON WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson.		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: There was no evidence of language objective during the lesson.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 0 COMMENT: There was no introduction of subject vocabulary in the lesson. There was no intentional emphasis in academic vocabulary.		

KEY VOCABULARY REVIEW	SCORE: 0 COMMENT: There was no evidence of intentionally key vocabulary review. Only at the end of the lesson, the teacher retook the concept of multiplication.
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: There was no personalization of content. It was only problems and exercises from the book.
SCAFFOLDING	SCORE: 3 COMMENT: Teacher allowed the students to look back in the book and notebook to find information to solve the tasks. The teacher gave strategies to multiply to each group. She told to one of the groups that multiplying 3x4 was “like adding 3+3+3+3+3.” The teacher helped the students to break down information from the problems to identify relevant information to solve it. Using drawings to have visual support to solve the problem.
COMMUNICATION LEARNER/ LEARNER	SCORE: 3

	COMMENT: There was team work and the students supported each other to complete the task. One group was discussing about possible strategies to solve the problems. They concluded that if they added, probably the solution would be greater than the possible answers given in the book. However the conversation between the students was in Spanish all the time.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas. Students addressed to the teacher in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: The students only used the math book.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 1 COMMENT: Only when asking questions to the teacher. There was no evidence of an intentional task in which the students had to show language knowledge, neither academic nor general language.

CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: The students constantly applied knowledge while solving the activities in the book.
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: Mostly reading and writing solutions to the problems in the book. Speaking in English only while interacting with the teacher. The teacher encouraged the students to speak in English during the lesson.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activity.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.
FEEDBACK	SCORE: 0 COMMENT: There was no feedback of the activity.
CONTENT CONCEPT REVIEW	SCORE: 2

	COMMENT: The entire lesson was a review of previous concepts. In order to wrap up the lesson, the teacher reviewed some main aspects about multiplication. "3x3 is how many groups of what?" The students answered "3 groups of 3." So the teacher asked in which other form they might say that, and the students answered that it was "the same a 3+3+3."
ASSESSMENT	SCORE: 3 COMMENT: The entire lesson was summative assessment.

Appendix 22

OBSERVATION ONE

<table>
<tr><td>DATE: 30/09/15
PLACE: 4th grade classroom</td><td>OBSERVER: DIANA PEREZ</td><td>TEACHER OBSERVED: PATTY</td><td>GRADE: 4TH</td></tr>
<tr><td colspan="4">MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT</td></tr>
<tr><td>CONTENT OBJECTIVES</td><td colspan="3">SCORE: 1

COMMENT: Learning objective can be inferred while observing the development of the lesson.</td></tr>
<tr><td>LANGUAGE OBJECTIVES</td><td colspan="3">SCORE: 0

COMMENT: There was no evidence of language objective during the lesson. However, the teacher gave some language support to help students understand a task. Because the students could not find the task, the teacher interrupted the lesson and started reviewing prepositions (above, below, down) in order to help students find the location of the task.</td></tr>
<tr><td>CONTENT CONCEPTS</td><td colspan="3">SCORE: 3

COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.</td></tr>
<tr><td>SUBJECT VOCABULARY</td><td colspan="3">SCORE: 2
COMMENT: There was no introduction of new vocabulary, but there was review of previously learned vocabulary related to addition at the beginning of the lesson.</td></tr>
</table>

KEY VOCABULARY REVIEW	SCORE: 2 COMMENT: There was review of key vocabulary at the beginning of the lesson “first addend”, “second addend”, “plus,” “carry one”,
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: There was no relation of content with real life.
SCAFFOLDING	SCORE: 3 COMMENT: The teacher asked the students to help her solve the problem step-by-step, modeling. place value chart, and explain the concept of regrouping again.
COMMUNICATION LEARNER/ LEARNER	SCORE: 2 COMMENT: students supported each other in order to clarify instructions. Students gave feedback to each other and discuss answers. There was no team work.
COMMUNICATION TEACHER / STUDENT	SCORE:3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas
STUDENT’S TIME TO RESPOND	SCORE: 3

	COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: Somewhat good material and resources for the age, level and learning objectives.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 2 COMMENT: Some opportunities to use language knowledge in different contexts
CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use content knowledge in different contexts.
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: Mostly reading, speaking and somehow writing.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activity.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.

FEEDBACK	SCORE: 2 COMMENT: There was no feedback of homework from the teacher. However, the students were able to give feedback between them and the teacher also gave feedback at the end of the activity. Positive feedback; highlighting some strengths but emphasizing mistakes.
CONTENT CONCEPT REVIEW	SCORE: 0 COMMENT: there was no wrap-up session at the end of the lesson. It ended after checking the activity.
ASSESSMENT	SCORE: 3 COMMENT: Activities during the lesson provide good opportunities for assessment.

Appendix 23

OBSERVATION TWO

DATE: 30/10/15 PLACE: 4th grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: PATTY	GRADE: 4TH
MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson.		
LANGUAGE OBJECTIVES	SCORE: 0 COMMENT: There was no evidence of language objective during the lesson.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE:3 COMMENT: Clearly and intentionally emphasized through accurate activities.		
KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: Definition of line of symmetry. Association to remember the name of the		

	type of paper to be used for the activity (The teacher drew a square with her finger in the air and a dot to help the students remember the name of the paper dot paper), the teacher verified the definition of polygon. "Equal length". Review names of triangles
EXPLANATION OF CONTENT	SCORE:3 COMMENT: Clearly and intentionally explained through a variety of activities. For example, the explanation about properties of types of triangles and the number of lines in a hexagon.
PERSONAIZATION OF CONTENT	SCORE: 1 COMMENT: the content was not really connected to real life situations. All the activities were taken from the book.
SCAFFOLDING	SCORE: 3 COMMENT: Very well structured activities aiming at assisting and supporting students' learning: modeling, language support in terms of types of triangles, number of lines in a hexagon, explanation step by step on how to solve a problem.
COMMUNICATION LEARNER/ LEARNER	SCORE: 1 COMMENT: Students' interaction was with the whole class and mostly with the teacher. There was no team work.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas
STUDENT'S TIME TO RESPOND	

	SCORE: 3 COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: Mostly the course book and the square dot paper
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 2 COMMENT: Not all the students had the opportunity to speak and share work. They were mostly chosen randomly.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use content knowledge in different contexts
USE OF LANGUAGE SKILLS	SCORE: 2 COMMENT: Mostly reading and speaking.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the class.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.

FEEDBACK	SCORE: 3 COMMENT: The teacher was constantly promoting peer feedback and correcting mistakes together with the girls
CONTENT CONCEPT REVIEW	SCORE: 0 COMMENT: There was no wrap-up activity
ASSESSMENT	SCORE: 3 COMMENT: Good opportunities for assessment during the whole class

Appendix 24

OBSERVATION ONE

DATE: 24/09/15 PLACE: 5th grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: PATTY	GRADE: 5TH
MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson. The students had to learn how to express large multiplications.		
LANGUAGE OBJECTIVES	SCORE:1 COMMENT: Implicit: can be inferred throughout the development of the lesson. It may be said that the students had to read and write multiplication expressions mathematically.		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 3 COMMENT: The teacher introduced the concepts of power, exponent, and thousands, necessary to read operations mathematically		

KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: Clearly and intentionally emphasized through accurate activities. There was review of vocabulary in the warm up: factors, multiply, product. New vocabulary was used during the lesson.
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities. The teacher provided several examples and opportunities for the students to understand the content.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: There was no personalization of content. It was only problems and exercises from the book or created by the teacher, all decontextualized.
SCAFFOLDING	SCORE: 3 COMMENT: language support: meaning of highlight, the teacher modeled a problem for the students, break down multiplication of many digits, explanation step by step.
COMMUNICATION LEARNER/ LEARNER	SCORE: 3 COMMENT:

	Students compared work with classmates. This exchange of information was mostly in Spanish. There was a group that did not say a word during the exchange. Students share work with the rest of the class and asked for feedback by asking if they agreed or disagreed with their answer. During feedback, all the interaction was in English.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas. Students addressed to the teacher in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 3 COMMENT: The students used the math book, notebook, board.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: The students tried to explain in English while they were solving the problems on the board, but for some it was too complicated to explain in English and they said in Spanish the words that they did not know how to say ("10 a la dos") the teacher gave input to say in English "10 to the second power." Students asked for feedback. One of the students asked improperly ("you agree?"), but the teacher told her the correct way to ask ("Do you agree or disagree with me?").

CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use content knowledge with different tasks
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: Mostly reading, speaking, and writing specially subtraction sentences. The teacher encouraged the students to speak in English during the lesson. The listening took place during the interaction teacher / students.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activities.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.
FEEDBACK	SCORE: 3 COMMENT: positive feedback in the warm up: the teacher told the girls that they had done a good job. There was peer feedback between a student who shared answers and the rest of the class. The students had opportunities to discover mistakes by their own.

CONTENT CONCEPT REVIEW	SCORE: 2 COMMENT: Completing a chart by filling the gaps to complete the multiplication patterns. There was no feedback of the activity.
ASSESSMENT	SCORE: 3 COMMENT: Activities during the lesson provide good opportunities for assessment.

Appendix 25

OBSERVATION TWO

DATE: 15/10/15 PLACE: 5th grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: PATTY	GRADE: 5TH
MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson.		
LANGUAGE OBJECTIVES	SCORE: 1 COMMENT: There was no evidence of language objective during the lesson. It could be inferred that the language purpose was reading and writing complex multiplications		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 3 COMMENT: There was introduction of the topic “numerical expressions” and operation signs which were during the class.		

KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: review of the concept of numerical expressions in the warm up. Review of signs: plus, minus, times and divided by, “share and equally. ”as clue words for division
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: the teacher really didn’t spend much time explaining the topic. The exercises in the book were varied and offered different opportunities to practice the content. It seemed that the students have learned it previously.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: There was no personalization of content. It was only problems and exercises from the book.
SCAFFOLDING	SCORE: 3 COMMENT: The teacher modeled a problem to support the students. Patty broke down the problem step by step to help the students get familiar with the process. The teacher helped the students identify relevant information necessary to solve the problem.
COMMUNICATION LEARNER/ LEARNER	SCORE: 3

	COMMENT: There was team work. Students communicate in Spanish between themselves when solving the problems, but read the problems in English and gave feedback in English
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas. Students addressed to the teacher in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: The students mostly used the math book and the board.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Students explained how they knew what operation to choose to solve the problem. Students had to identify clue words and make decisions about the most suitable operation to solve the problem.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3

	COMMENT: The students constantly applied knowledge while solving the activities in the book.
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: Mostly reading and writing solutions to the problems in the book. Speaking in English while interacting with the teacher, sharing work, and when giving feedback. The teacher encouraged the students to speak in English during the lesson.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activity.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.
FEEDBACK	SCORE: 3 COMMENT: There was peer feedback between a student who shared answers and the rest of the class. The students had opportunities to discover mistakes by their own. The teacher supported peer feedback with comments either to confirm appropriate feedback or to ask in order to help the students realize mistakes.
CONTENT CONCEPT REVIEW	SCORE: 0

	COMMENT: There was no wrap-up activity at the end of the class. In order to wrap up the lesson, the teacher reviewed some main aspects about multiplication. “3x3 is how many groups of what?” The students answered “3 groups of 3.” So the teacher asked in which other form they might say that, and the students answered that it was “the same a 3+3+3.”
ASSESSMENT	SCORE: 3 COMMENT: The entire lesson was summative assessment.

Appendix 26

OBSERVATION ONE

<table>
<tr><td>DATE: 01/10/15
PLACE: 6th grade classroom</td><td>OBSERVER: DIANA PEREZ</td><td>TEACHER OBSERVED: PATTY</td><td>GRADE: 6TH</td></tr>
<tr><td colspan="4">MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT</td></tr>
<tr><td>CONTENT OBJECTIVES</td><td colspan="3">SCORE: 1

COMMENT: Learning objective can be inferred while observing the development of the lesson. (solve multiplications with decimals)</td></tr>
<tr><td>LANGUAGE OBJECTIVES</td><td colspan="3">SCORE: 0

COMMENT: There was no evidence of language objective during the lesson.</td></tr>
<tr><td>CONTENT CONCEPTS</td><td colspan="3">SCORE: 3

COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.</td></tr>
<tr><td>SUBJECT VOCABULARY</td><td colspan="3">SCORE: 0

COMMENT: There was no introduction of subject vocabulary in the lesson. Probably the vocabulary was introduced in a previous lesson. There was a review of some key words at the beginning of the class.</td></tr>
</table>

KEY VOCABULARY REVIEW	SCORE: 1 COMMENT: The teacher checked key words in the warm up problem: “rectangular shape” and “area”
EXPLANATION OF CONTENT	SCORE: 2 COMMENT: Little explanation of the content. The teacher reviewed the content at the beginning of the class and the students seemed to know the content very well. The students mainly worked in groups solving the assigned problems and exercises without help from the teacher.
PERSONAIZATION OF CONTENT	SCORE: 0 COMMENT: There was no personalization of content. It was only problems and exercises from the book.
SCAFFOLDING	SCORE: 1 COMMENT: The teacher reviewed the rules of multiplying decimals. She asked the students to help her multiply 22.5 x 13.2. The teacher monitored students’ work and solved questions when required.
COMMUNICATION LEARNER/ LEARNER	SCORE: 3 COMMENT: There was pair work to solve exercises from the book. The groups with the same exercises compared their answers and talked about difficulties they had experienced when solving

	the task. Students mostly communicate between them in Spanish.
COMMUNICATION TEACHER / STUDENT	SCORE: 2 COMMENT: Some opportunities to interact, clarify questions, and exchange ideas. Students addressed to the teacher in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: during the warmup, the students took extra time to solve the problem. During peer work, the time assigned to solve the task was not enough for the students. However, the teacher gave extra time to accomplish the tasks.
MATERIALS AND RESOURCES	SCORE: 2 COMMENT: The students only used the math book.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 2 COMMENT: The teacher asked the students to explain what they did to solve the problem in the warm up. One student explained that she used multiplication. Other girl mentioned that she estimated the decimals by rounding and got the answer. the students used the language while solving the problems.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3

	COMMENT: The students started describing each step while solving the multiplication. Evidently they knew the process. Students demonstrated content knowledge while solving the problems.
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: Mostly reading and writing solutions to the problems in the book. Speaking in English only while interacting with the teacher or checking work. The teacher encouraged the students to speak in English during the lesson.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activity.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.
FEEDBACK	SCORE: 2 COMMENT: Peer feedback: students compared work during the warm up and after finishing working in the book. There was little teacher feedback.
CONTENT CONCEPT REVIEW	SCORE: 0 COMMENT: there was no consolidation of the task at the end of the class. Actually there

	lesson was unfinished.
ASSESSMENT	SCORE: 3 COMMENT: The activities provided good opportunities for assessment.

Appendix 27

OBSERVATION TWO

DATE: 27/10/15 PLACE: 6th grade classroom	OBSERVER: DIANA PEREZ	TEACHER OBSERVED: PATTY	GRADE: 6TH
MARK A SCORE FROM 0 TO 3 TO REFLECT WHAT IS BEING OBSERVED DURING THE LESSON AND ADD A COMMENT			
CONTENT OBJECTIVES	SCORE: 1 COMMENT: Learning objective can be inferred while observing the development of the lesson. (identifying different used of positive and negative numbers)		
LANGUAGE OBJECTIVES	SCORE: 1 COMMENT: Language objective can be inferred throughout the development of the lesson. (describe different situations in which positive and negative numbers are used in real life)		
CONTENT CONCEPTS	SCORE: 3 COMMENT: Appropriate for the level and age of the students; aligned to the syllabus of the course.		
SUBJECT VOCABULARY	SCORE: 3 COMMENT: There was no introduction of subject vocabulary in the lesson. The students		

	were already familiar with the vocabulary. however the subject vocabulary was clearly and intentionally emphasized through accurate activities.
KEY VOCABULARY REVIEW	SCORE: 3 COMMENT: Clearly and intentionally emphasized during the activities: “positive and negative numbers”, mathematical term “height”, graphic organizer, ruler
EXPLANATION OF CONTENT	SCORE: 3 COMMENT: Clearly and intentionally explained through a variety of activities.
PERSONAIZATION OF CONTENT	SCORE: 3 COMMENT: The students provided examples of how they use positive and negative numbers in real life. They told the teacher that they used positive numbers all the time: to measure temperature, distance, time, weight, pressure, and other examples.in terms of negative numbers, the students mentioned: “When we’re sick, we use a thermometer, when we are in an ocean… underwater, the teacher said; “to measure losing weight”; to subtract for example 5-6, the answer is a negative number. Used flashcards with real life experiences to discriminate the use of positive and negative numbers.
SCAFFOLDING	SCORE: 3 COMMENT: The teacher monitored students’ work and supported those who required it. The teacher provided language support when it was required. The teacher gave input to think about other aspects to measure during the presentations. The teacher used a Frayer model to help the students define positive and negative numbers.

COMMUNICATION LEARNER/ LEARNER	SCORE: 3 COMMENT: There was team work (groups of four). The students planned and made decisions when solving the task. Some in English and others in Spanish. The students presented work to the rest of the class in English and received feedback from their classmates during the presentations.
COMMUNICATION TEACHER / STUDENT	SCORE: 3 COMMENT: Frequent opportunities to interact, clarify questions, and exchange ideas. Students addressed to the teacher in English.
STUDENT'S TIME TO RESPOND	SCORE: 3 COMMENT: Appropriate for the level and age of the students
MATERIALS AND RESOURCES	SCORE: 3 COMMENT: The students used accurate material and resources for the age, level and learning objectives.
LANGUAGE KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: excellent opportunities to use the language during the whole lesson.

	Students described picture and used math language to explain how to use positive and negative numbers in real life.
CONTENT KNOWLEDGE APPLICATION	SCORE: 3 COMMENT: Frequent opportunities to use content knowledge in different contexts.
USE OF LANGUAGE SKILLS	SCORE: 3 COMMENT: The class was mostly focused in speaking and listening. There was some writing at the end of the lesson, but the students did not complete the task due to time.
ENGAGEMENT	SCORE: 3 COMMENT: Students were engaged during the activity.
PACE	SCORE: 3 COMMENT: Appropriate for the students' abilities and level.
FEEDBACK	SCORE: 3 COMMENT: Positive feedback and support during the presentations.
CONTENT CONCEPT REVIEW	SCORE: 3

	COMMENT: There was a conclusion at the end of the main activity in which the students demonstrated understanding of the content. At the end of the class, the teacher asked if people could use positive and negative numbers in daily life. A student said yes, but that it depended on the situation.
ASSESSMENT	SCORE: 3 COMMENT: Activities during the lesson provide good opportunities for assessment.

Appendix 28

Curriculum analysis: 1st term - first grade

RESEARCHER: DIANA PEREZ ALVAREZ	SCHOOL: GLC	SUBJECT: MATHEMATICS	TERM: I	GRADE: FIRST
1. STANDARD The student should be able to solve daily and academic problems using counting, calculation, solving problems strategies, knowledge of geometry, statistics and thinking and math skills.		COMMENT: It is a whole year standard which points to develop content and skills in order to solve daily and academic problems.		
2. BENCHMARK Use abilities for counting and calculation to solve daily and academic problems.		COMMENT: The benchmark also points to content and using math knowledge to solve problems		
3. CONTENT OBJECTIVES ✓ Counts forwards from 1 to 100. ✓ Counts and writes, forwards and backwards, numbers from 1 to 60. ✓ Uses knowledge about addition and subtraction to solve simple problems and operations. ✓ Divide shapes in halves, thirds and fourths		COMMENT: The content objectives are specific; determine exactly what has to be learned and taught		
4. LANGUAGE OBJECTIVES ✓ Writes numbers in word name from 1 to 40. ✓ Describes 2D and 3D shapes, determining the number of sides and vertices, faces, types of faces and how they move.		COMMENT: The curriculum does not determine difference between language or content objectives. However, due to the nature of the skills involved in the process, these two objectives could involve		

	some language in terms of writing (although it concerns only spelling of numbers in word name) and a kind of descriptive narrative in order to describe main characteristics of 2D and 3D shapes.
5. CONTENT CONCEPTS **Numbers and the number system:** ✓ Recite and count objects up to 100, recognizing conservation of number. ✓ Recite and write, forwards and backwards, numbers from 1 to 60 ✓ Write numbers in word name from one to twenty. ✓ Use more or less to compare two numbers. ✓ Order numbers establishing order: before, after or between. ✓ Give a sensible estimate of some objects that can be checked by counting. ✓ Count on in twos, beginning to recognize odd/even numbers to 60. **Set Theory** ✓ Define the concept of sets, identify if an element belongs to or does not belong to a set. **Calculation:** ✓ Understand addition as counting on and combining two sets and recording related addition sentences ✓ Understand subtraction as counting back and "taking away" and recording related subtraction sentences ✓ Understand difference as "how many more to make?" ✓ Add/subtract a single digit number by counting on/back ✓ Begin to use the +, — and = signs to record calculations in number sentences. **Geometry:** ✓ Name and sort common 2D shapes using features such as	COMMENT: The content points to develop four components: numbers and the numerical system, the set theory, calculation in terms of understanding addition and subtraction, signs recognition, and understanding of the concept of difference; and geometry

number of sides, curved or straight. Use them to make pattern models ✓ Find and recognize halves, thirds and fourths of shapes, using lines of symmetry for halves. ✓ Use flip, turn, or slide to describe movement of objects. ✓ Name and sort common 3D shapes using features such as number of faces, flat or curved faces. Use them to make patterns and models.	
6. SUBJECT VOCABULARY ✓ Word name of all numbers from 1 to 10 ✓ More, less ✓ Before, after, between ✓ Estimate, count ✓ Set, element, belong, does not belong ✓ Equal, plus, minus, sets, addition sentence, subtraction sentence, take away, how many more, count on, count back, subtract, add, difference, sum ✓ Circle, hexagon, rectangle, square, triangle, trapezoid ✓ Closed shapes, curved, straight, sides, vertices, vertex Equal parts, unequal parts, equal shares, unequal shares, half of, halves, fourths, quarters, thirds ✓ Sphere, cone, cylinder, rectangular prism, cube ✓ Flat surface, curved surface	COMMENT: there is specific vocabulary related to the content to be taught during the term.
7. COMMUNICATIVE SKILLS ✓ Recite and count objects up to 100, recognizing conservation of number. ✓ Recite and write, forwards and backwards, numbers from 1 to 60 ✓ Write numbers in word name from one to twenty	COMMENT: there is no evidence of explicit language skills to be developed during the term. However there are two aspects of content that point to reciting and writing numbers in Standard form and word name.
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 29

Curriculum analysis: 1st term - second grade

<table>
<tr><td>RESEARCHER: DIANA PEREZ ALVAREZ</td><td>SCHOOL: GLC</td><td>SUBJECT: MATHEMATICS</td><td>TERM: I</td><td>GRADE: SECOND</td></tr>
<tr><td colspan="2">1. STANDARD
The student should be able to use knowledge of numbers and the numerical system, calculation, solving problems strategies, geometry, statistics, thinking and math skills to solve daily problems and academic challenges.</td><td colspan="3">COMMENT: It is a whole year standard which points to develop content and skills in order to solve daily and academic problems.
Specifies whole year content: numbers and the number system, geometry, statistics, thinking and math skills.</td></tr>
<tr><td colspan="2">2. BENCHMARK
Use knowledge of geometry, numbers and the number system to add or subtract in order to solve simple problems and academic challenges.</td><td colspan="3">COMMENT:
The benchmark also points to content and using math knowledge to solve problems</td></tr>
<tr><td colspan="2">3. CONTENT OBJECTIVES
✓ Classifies numbers up to 100 in odd or even, establishing which are greater than or less than others.
✓ Uses the basic concepts of the set theory to classify and relate information in different ways.
✓ Uses addition and subtraction strategies to solve operations and problems in different contexts.
✓ Draws 3D shapes following given steps.</td><td colspan="3">COMMENT:
The content objectives are specific; determine exactly what has to be learned and taught.</td></tr>
<tr><td colspan="2">4. LANGUAGE OBJECTIVES
✓ Writes, in twos, fives and tens whether backwards or forwards, numbers up to 100.
✓ Describes 3D shapes around us, determining properties such as number of faces, edges or vertices.</td><td colspan="3">COMMENT:
The curriculum does not determine difference between language or content objectives. However, due to the nature of the skills involved in the process, these three objectives could involve some language in terms of writing (although it concerns only</td></tr>
</table>

✓ Describes 2D shapes, discriminating properties such as number of sides, vertices and angles.	spelling of numbers in word name) and a kind of descriptive narrative in order to describe main characteristics of 2D and 3D shapes.
5. CONTENT CONCEPTS **Numbers and the number system:** ✓ Count, read and write numbers to 100 and back again. ✓ Sort numbers up to 100 in odd or even numbers ✓ Write numbers in word name from 1 to 100. ✓ Partition two digit numbers in tens and ones. ✓ Count in ones, twos, fives and tens, from single- and two-digit numbers and back again, and use grouping in twos, fives or tens to count larger groups of objects. ✓ Order numbers to 100; compare two numbers using the > and <signs. ✓ Order numbers from greatest to least and least to greatest ✓ Give a sensible estimate of up to 100 objects. ✓ Round two-digit numbers to the nearest 10. **Set Theory** ✓ Explain the concept of set. ✓ Identify elements in a set ✓ Represent elements of a set in a Venn diagram. ✓ Compares the elements in a set according to their characteristics ✓ Find the amount of elements in a set. ✓ Recognize when a set has more elements than other. ✓ Use the symbols $\in$ and $\notin$. **Calculation:** ✓ Find and learn by heart all numbers pairs to 10 ✓ Partition all numbers to 20 into pairs and record the related addition and subtraction facts. ✓ Understand that addition can be done in any order, but subtraction cannot.	COMMENT: The content points to develop five components: numbers and the numerical system, the set theory, calculation, problem solving skills, and geometry

✓ Understand subtraction as both difference and take away. ✓ Add and subtract a single digit to and from a two-digit number. ✓ Add pairs of two- digit numbers ✓ Use the = sign to represent equality, e.g. 16 + 4 = 17 + 3. ✓ Add three and more addends. ✓ Start using regrouping to add. ✓ Solve algebraic expressions with a missing element. Geometry: ✓ Sort, name, describe and make 3D shapes referring to their properties ✓ Recognize 2D drawings of 3D shapes. ✓ Find examples of 2D and 3D shapes in the environment. ✓ Sort, name, describe, visualize and draw 2D shapes (e.g. squares, rectangles, circles, regular and irregular pentagons and hexagons) referring to their properties; recognize common 2D shapes in different positions and orientations. ✓ Name some polygons: quadrilateral, pentagon, hexagon ✓ Identify angles in polygons ✓ Recognize that a right angle is a quarter turn. **PROBLEM SOLVING (whole year)** ✓ Choose appropriate mental strategies to carry out calculations and explain how they worked out the answer. ✓ Explore number problems and puzzles. ✓ Explain methods and reasoning orally. ✓ Make sense of simple word problems (single and easy two-step), decide what operations (addition or subtraction, simple multiplication or division) are needed to solve them and, with help, represent them, with objects or drawings or on a number line. ✓ Make up a number story to go with a calculation, including in the context of money. ✓ Check the answer to an addition by adding the numbers in a	

different order or by using a different strategy, e.g. 35 + 19 by adding 20 to 35 and subtracting 1, and by adding 30 + 10 and 5 + 9. ✓ Check a subtraction by adding the answer to the smaller number in the original subtraction. ✓ Describe and continue patterns which count on in twos, threes, fours or fives to 30 or more. ✓ Identify simple relationships between numbers and shapes, e.g. this number is double ...; these shapes all have ... sides. ✓ Make a sensible estimate for the answer to a calculation. ✓ Consider whether an answer is reasonable.	
6. SUBJECT VOCABULARY ✓ Odd numbers, even numbers, tens and ones ✓ Word name of numbers from 1 to 100 ✓ Digit, single digit number, two-digit number ✓ Twos, fives, tens, ✓ Greater than, less than ✓ Greatest, least ✓ Number pairs, equals ✓ Addition, addition facts, plus, count on, sums, addends, ✓ subtraction, subtraction facts, minus, count back, differences, take away ✓ regroup ✓ Shapes, rectangle, triangle, square ✓ cubes, cuboids, (rectangular prism) cones, cylinders, spheres, parallelepiped (A polyhedron with six faces, all of which are parallelograms.) and pyramids ✓ equal parts ✓ faces, edges, vertices, vertex	COMMENT: there is specific vocabulary related to the content to be taught during the term.
7. LANGUAGE SKILLS ✓ Explain methods and reasoning orally. ✓ Explain how they worked out the answer.	COMMENT: there is some evidence of functional language in terms of explaining methods and reasoning orally and explaining processes. This requires the development of some

✓ Make up a number story to go with a calculation, including in the context of money.	oral skills. The number story, also require the development of writing skills to create word problems.
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 30

Curriculum analysis: 1st term - third grade

RESEARCHER: DIANA PEREZ ALVAREZ	SCHOOL: GLC	SUBJECT: mathematics	TERM: I	GRADE: Third
1. STANDARD The student should be able to solve academic and daily problems, using knowledge about set theory, numbers and the numerical system, calculation, solving problems strategies, geometry, statistics, thinking and math skills accurately.		COMMENT: aims at solving academic and daily problems based on knowledge related to set theory, numbers and the numerical system, calculation, solving problem strategies, geometry, thinking and math skills.		
2. BENCHMARK Solves problems in different contexts using knowledge about numbers, addition, subtraction and multiplication skills and strategies.		COMMENT: Supports the standard in terms of solving problems but focuses on knowledge about numbers, addition, subtraction, and multiplication.		
3. CONTENT OBJECTIVES ✓ Demonstrates knowledge of the theory of set by using appropriate symbols and identifying different types of sets. ✓ Uses different strategies to represent numbers up to 10,000. ✓ Use addition, subtraction, and multiplication strategies and properties to solve operations and problems in different contexts. ✓ Draws regular and irregular 2D shapes using knowledge about angles and main characteristics of polygons		COMMENT: Objectives clearly point to content knowledge.		
4. LANGUAGE OBJECTIVES ✓ Explain a choice of calculation strategy and show how the		COMMENT:		

answer was worked out. ✓ Explain methods and reasoning orally, including initial thoughts about possible answers to a problem.	✓ There is no evidence of language objectives. However, some problem solving strategies include explaining a choice of calculation strategy and showing how the answer was worked out, and explaining methods and reasoning orally, including initial thoughts about possible answers to a problem, which may be considered as language objectives.
5. CONTENT CONCEPTS **Set theory, numbers and the number system:** ✓ <u>Define the concept of set and mention types of sets: null, void or empty set (with no elements), singleton set (with one element), finite and infinite set. Conclude that numbers are infinite, so that, they all belong to the infinite set.</u> ✓ <u>Write the cardinality of a set</u> ✓ <u>Use curly brackets { }, also known as set brackets or braces, to show a set, and separate each element with commas (,). Use three dots (…) to show infinite.</u> ✓ <u>Classify whether an element belongs or not to a set. Use the symbols ∈ and ∉.</u> ✓ <u>Identify what elements of a set belong to a subset.</u> ✓ <u>Recognize when a set is a subset of another</u> ✓ <u>Recite numbers from 10,000 to 100,000 and beyond.</u> ✓ <u>Read and write numbers to at least 100,000.</u> ✓ Count on and back in ones, tens and hundreds from two- and three digit numbers. ✓ Count on and back in steps of 2, 3, 4 and 5 to at least 1,000. ✓ Understand what each digit represents in three-digit numbers, determining place value in terms of hundreds, tens and ones. ✓ Write numbers, up to 100,000, in standard form, word	COMMENT: The content points to develop five components: numbers and the numerical system, the set theory, calculation, problem solving skills, and geometry. Problem solving skills have to be worked during the whole school year.

name and expanded form. ✓ Determine whether a three digit number is even or odd. ✓ Determine which number is greatest or least ✓ Find 1, 10, and 100 more/less than two- and three-digit numbers. ✓ Place a three-digit number on a number line marked off in multiples of 100. ✓ Place a three-digit number on a number line marked off in multiples of 10. ✓ Compare three-digit numbers, use < and > signs, and find a number in between. ✓ Order two- and three-digit numbers from least to greatest or greatest to least. ✓ Round to the nearest 10, or 100. **Calculation:** ✓ Know addition and subtraction facts for all numbers to 20. ✓ Know the following addition and subtraction facts: – multiples of 100 with a total of 1000 – multiples of 5 with a total of 100 ✓ Add and subtract pairs of two-digit numbers. ✓ Add three-digit and two-digit numbers using notes to support. ✓ Re-order an addition to help with the calculation, e.g. 41 + 54, by adding 40 to 54, then 1. ✓ Add/subtract single-digit numbers to/from three-digit numbers. ✓ Find 20, 30 … 90, 100, 200, 300 more/less than three-digit numbers. ✓ Regroup to add or subtract three-digit numbers. ✓ Add and subtract 10 and multiples of 10 to and from two- , three- and four digit numbers. ✓ Add 100 and multiples of 100 to three-and four- digit numbers.	

✓ Use the = sign to represent equality, e.g. 75 + 25 = 95 + 5. ✓ Add several small numbers. ✓ Find complements to 100, solving number equations such as 78 + □ = 100. ✓ Know the properties of addition and multiplication. ✓ Relate addition and multiplication. ✓ Model multiplication. ✓ Know multiplication/division facts from 0 to 10, and solve multiplications using different strategies. **Geometry:** ✓ Identify, describe and draw regular and irregular 2D shapes including pentagons, hexagons, octagons and semi-circles. ✓ Classify 2D shapes according to the number of sides, vertices and right angles. ✓ Recognize that a straight line is equivalent to two right angles. ✓ Identify and draw right and straight angles. ✓ Know that a right angle measures 90° ✓ Know that a straight line measures 180° **Problem solving strategies (whole year)** ✓ Choose appropriate mental strategies to carry out calculations. ✓ Begin to understand everyday systems of measurement in length, weight, capacity and time and use these to make measurements as appropriate. ✓ Make sense of and solve word problems, single (all four operations) and two-step (addition and subtraction), and begin to represent them, e.g. with drawings or on a number line. ✓ Check the results of adding two numbers using subtraction, and several numbers by adding in a different order. ✓ Check subtraction by adding the answer to the smaller number in the original calculation.	

✓ Check multiplication by reversing the order, e.g. checking that $6 \times 4 = 24$ by doing 4×6. ✓ Check a division using multiplication, e.g. check $12 \div 4 = 3$ by doing 4×3. ✓ Recognize the relationships between different 2D shapes. ✓ Identify the differences and similarities between different 3D shapes. ✓ Estimate and approximate when calculating, and check working. ✓ Make a sensible estimate for the answer to a calculation, e.g. using rounding. ✓ Consider whether an answer is reasonable. ✓ Make up a number story to go with a calculation, including in the context of money. ✓ Explain a choice of calculation strategy and show how the answer was worked out. ✓ Explore and solve number problems and puzzles, e.g. logic problems. ✓ Use ordered lists and tables to help to solve problems systematically. ✓ Describe and continue patterns which count on or back in steps of 2, 3, 4, 5, 10, or 100. ✓ Identify simple relationships between numbers, e.g. each number is three more than the number before it. ✓ Identify simple relationships between shapes, e.g. these shapes all have the same number of lines of symmetry. ✓ Investigate a simple general statement by finding examples which do or do not satisfy it, e.g. when adding 10 to a number, the first digit remains the same. ✓ Explain methods and reasoning orally, including initial thoughts about possible answers to a problem.	
6. SUBJECT VOCABULARY	COMMENT:

✓ Cardinality: The number of elements in a set., whether the set is finite or infinite. Note: Not all infinite sets have the same cardinality. ✓ Word name of numbers from 1 to 100 ✓ Whole, fraction, half, quarter and three quarters ✓ Pattern, addition and subtraction facts, round, estimate, compatible numbers, addend, addition, sum, difference, subtraction, number sentence, related facts ✓ Commutative property of addition, associative property of addition ✓ Array, equal groups, factor, multiply, product, multiple, ✓ Commutative property of multiplication, identity property of multiplication, zero property of multiplication, distributive property, associative property of multiplication ✓ Multiplication of odd and even numbers ✓ Plane shape, point, endpoints, line, line segment, ray, two-dimensional shapes, closed shape, open shape, angle, vertex, right angle, polygons, triangle, quadrilateral, pentagon, hexagon, octagon, decagon ✓ Kinds of angles, right angle, straight angle, protractor, degree.	Very clear and specific content vocabulary. In fact there is a note for the teacher in order to determine the concept of cardinality in a set.
7. LANGUAGE SKILLS ✓ Explain methods and reasoning orally, including initial thoughts about possible answers to a problem. ✓ Make up a number story to go with a calculation, including in the context of money. ✓ Explain a choice of calculation strategy and show how the answer was worked out.	COMMENT: Language skills are required to read, understand and create word problems. Students need to learn how to explain and reason orally in order to support the possible answer of a problem; therefore they need to develop ability to justify an answer.
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 31

Curriculum analysis: 1st term - fourth grade

<table>
<tr><td>RESEARCHER: DIANA PEREZ ALVAREZ</td><td>SCHOOL: GLC</td><td>SUBJECT: MATHEMATICS</td><td>TERM: I</td><td>GRADE: FOURTH</td></tr>
<tr><td colspan="2">1. STANDARD
The student should be able to solve academic and daily problems in different contexts, using mathematical terminology, knowledge on set theory, numbers and the numerical system, calculation, measurement, solving problems strategies, geometry skills, statistics, and mental math skills effectively.</td><td colspan="3">COMMENT: It is a whole year standard which points to develop content and skills in order to solve daily and academic problems.
Specifies whole year content: numbers and the number system, calculation, measurement, geometry, statistics, and mental math skills.</td></tr>
<tr><td colspan="2">2. BENCHMARK
Uses knowledge of set theory, numbers and the number system, addition, subtraction and multiplication strategies to solve problems in different contexts.</td><td colspan="3">COMMENT:
The benchmark also points to content and using math knowledge to solve problems in different contexts.</td></tr>
<tr><td colspan="2">3. CONTENT OBJECTIVES
✓ Uses the basic concepts of the set theory to classify and relate information in different ways.
✓ Represents numbers in standard form, word name, and expanded form from 1 to 1,000,000, recognizing place value of each digit and classifying numbers in odd or even.
✓ Solves problems in different contexts using properties and appropriate strategies for addition and multiplication.
✓ Solves problems and challenges using knowledge about types of lines, properties of polygons, and symmetry.</td><td colspan="3">COMMENT:
The content objectives are specific; determine exactly what has to be learned and taught.</td></tr>
<tr><td colspan="2">4. LANGUAGE OBJECTIVES
✓ Explain the concept of set and classify them in singleton, empty, finite, and infinite.
✓ Read and write numbers up to 1,000, 000 in standard form,</td><td colspan="3">COMMENT:
There is no evidence of language objectives.
However, due to the nature of the skills involved in the process, the content described here could involve some language in</td></tr>
</table>

word name and extended form ✓ Describe and identify the position of a square on a grid of squares where rows and columns are numbered and/or lettered. ✓ Make up a number story for a calculation, including in the context of measures. ✓ Explain reasons for a choice of strategy when multiplying or dividing. ✓ Describe and continue number sequences, e.g. 7, 4, 1, –2 ... identifying the relationship between each number. ✓ Explain methods and reasoning orally and in writing; make hypotheses and test them out.	terms of explaining the concept of set, the reading and spelling of numbers specially in word name, description skills in order to describe the position of a square on a grid or a number sequence; writing skills in order to write word problems (number story), argumentation in order give reasons to choose strategies to multiply, divide, and hypothesize.
5. CONTENT CONCEPTS **Set theory, number and the number system:** ✓ Explain the concept of set and classify them in singleton, empty, finite, and infinite. ✓ Identify elements or members in a set. ✓ Classify whether an element belongs or not to a set. Use the symbols ∈ and ∉. ✓ Shows equality in sets (=).e.g. A {1,2,3} = B{1,3,2} ✓ Recognize an empty set by its symbol ∅. ✓ Understand the concept of subset ⊆ and proper subset ⊂ ✓ Shows union and intersection in sets ∪ and ∩ ✓ Extend and comprehend sets: the elements that make part of a set; properties of the elements ✓ Read and write numbers up to 1,000, 000 in standard form, word name and extended form. ✓ Count on and back in ones, tens, hundreds and thousands from four-digit numbers. ✓ Understand what each digit represents in a three- or four-digit number partitioning into thousands, hundreds, tens and units (ones).	COMMENT: The content points to develop five components: numbers and the numerical system, the set theory, calculation, problem solving skills, and geometry

- ✓ Differentiate prime and composite numbers.
- ✓ Differentiate odd and even numbers. Make general statements about the sums and differences of odd and even numbers e.g. odd + odd = even
- ✓ Round three- and four-digit numbers to the nearest 10 or 100.
- ✓ Position accurately numbers up to 1000 on an empty number line or line marked off in multiples of 10 or 100.
- ✓ Estimate where three- and four-digit numbers lie on empty 0–1000 or 0–10 000 lines.
- ✓ Compare pairs of three-digit or four-digit numbers, using the > and < signs, and find a number in between each pair.
- ✓ Use roman numerals from I to C
- ✓ Use negative numbers in context, e.g. temperature.
- ✓ Recognize multiples of 5, 10 and 100 up to 1000

Calculation:

- ✓ Know the properties of addition and multiplication and use them to solve operations quickly.
- ✓ Derive quickly pairs of two-digit numbers with a total of 100, e.g. 72 + □ = 100.
- ✓ Derive quickly pairs of multiples of 50 with a total of 1000, e.g. 850 + □ = 1000
- ✓ Add four, five or six small numbers, finding pairs that equal 10 or 20.
- ✓ Add three two-digit multiples of 10, e.g. 40 + 70 + 50.
- ✓ Add and subtract near multiples of 10 or 100 to or from three-digit numbers, e.g. 367 – 198 or 278 + 49.
- ✓ Add or subtract any pair of two- or three-digit numbers, choosing an appropriate strategy.
- ✓ Find a difference between near multiples of 100, e.g. 304 – 296.
- ✓ Subtract a small number crossing 100, e.g. 304 – 8.
- ✓ Derive quickly doubles of all whole numbers to 50, doubles

of multiples of 10 to 500, doubles of multiples of 100 to 5000, and corresponding halves. ✓ Add and subtract pairs of three- and four-digit numbers. ✓ Subtract a two-digit number from a three-digit number. ✓ Regroup to add and subtract. ✓ Subtract from numbers ending in zeroes. ✓ Know all multiplication tables and derive division facts. ✓ Recognize and begin to know multiples of 2, 3, 4, 5 and 10, up to the tenth multiple. ✓ Multiply multiples of 10 to 90 by a single-digit number. ✓ Estimate and multiply two-digit numbers by two-digit numbers. ✓ Model factors, and relate factors with divisibility, following divisibility rules ✓ Identify common factors and common multiples: composite and prime numbers. ✓ Multiply a two-digit number by a larger number. Multiply numbers ending in zeroes. ✓ Solve inequalities with multiplications. **Geometry:** ✓ Identify line, line segment, ray, and angles. ✓ Determine whether a figure is open or closed. ✓ Identify kinds of triangles: acute, right, obtuse, scalene, isosceles and equilateral. ✓ Identify and draw different types of lines: intersecting, parallel and perpendicular. ✓ Classify 2D shapes according to the number of sides, vertices and right angles. ✓ Classify polygons (including a range of quadrilaterals) using criteria such as the number of right angles, whether or not they are regular and their symmetrical properties. ✓ Identify and sketch lines of symmetry in 2D shapes and patterns.	

✓ Find examples of shapes and symmetry in the environment and in art. ✓ Differentiate congruence and similarities, emphasizing the concept of similarity. (≡) (≈) ✓ Describe and identify the position of a square on a grid of squares where rows and columns are numbered and/or lettered. **PROBLEM SOLVING (whole year)** ✓ Choose appropriate mental or written strategies to carry out calculations involving addition or subtraction. ✓ Understand everyday systems of measurement in length, weight, capacity and time and use these to solve simple problems as appropriate. ✓ Check the results of adding numbers by adding them in a different order or by subtracting one number from the total. ✓ Check subtraction by adding the answer to the smaller number in the original calculation. ✓ Check multiplication using a different technique, e.g. check $6 \times 8 = 48$ by doing 6×4 and doubling. ✓ Check the result of a division using multiplication, e.g. multiply 4 by 12 to check $48 \div 4$. ✓ Recognize the relationships between 2D shapes and identify the differences and similarities between 3D shapes. ✓ Estimate and approximate when calculating, and check working. ✓ Make up a number story for a calculation, including in the context of measures. ✓ Explain reasons for a choice of strategy when multiplying or dividing. ✓ Choose strategies to find answers to addition or subtraction problems; explain and show working. ✓ Explore and solve number problems and puzzles, e.g. logic	

problems. ✓ Use ordered lists and tables to help to solve problems systematically. ✓ Describe and continue number sequences, e.g. 7, 4, 1, –2 ... identifying the relationship between each number. ✓ Identify simple relationships between shapes, e.g. these polygons are all regular because… ✓ Investigate a simple general statement by finding examples which do or do not satisfy it. ✓ Explain methods and reasoning orally and in writing; make hypotheses and test them out.	
6. SUBJECT VOCABULARY ✓ Set, element, member, singleton, finite, infinite, belong, doesn't belong, equal, empty set, subset, proper subset, union, intersection ✓ Ones, tens, hundreds, thousands, ten thousands, inverse operations, estimate, period, round, standard form, word form, expanded form. ✓ All roman numbers from I to C ✓ Negative numbers ✓ Properties of addition: commutative, associative, identity, and distributive ✓ Properties of multiplication: commutative, associative, multiplicative identity, distributive, and zero property ✓ Multiple, pairs of multiples, sum, difference, factor, product, regroup, partial product, compatible numbers ✓ Multiple, factor, common factor, common multiple, composite number, divisible, pattern, prime number, term ✓ Point, line, line segment, ray, angle, right angle, straight angle, acute angle, obtuse angle, adjacent angle ✓ Triangle: obtuse, right, scalene, isosceles, equilateral ✓ Lines: intersecting, parallel, perpendicular.	COMMENT: there is specific vocabulary related to the content to be taught during the term.

✓ Symmetry, line of symmetry	
7. LANGUAGE SKILLS ✓ Explain the concept of set and classify them in singleton, empty, finite, and infinite. ✓ Read and write numbers up to 1,000, 000 in standard form, word name and extended form ✓ Describe and identify the position of a square on a grid of squares where rows and columns are numbered and/or lettered. ✓ Make up a number story for a calculation, including in the context of measures. ✓ Explain reasons for a choice of strategy when multiplying or dividing. ✓ Describe and continue number sequences, e.g. 7, 4, 1, –2 ... identifying the relationship between each number.	COMMENT: In order to achieve some content in which language is involved, it is necessary to develop functional language in order to explain, read and write problems and numbers, and describe with mathematical terminology.
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 32

Curriculum analysis: 1st term - fifth grade

<table>
<tr><td>RESEARCHER: DIANA PEREZ ALVAREZ</td><td>SCHOOL: GLC</td><td>SUBJECT: MATHEMATICS</td><td>TERM: I</td><td>GRADE: FIFTH</td></tr>
<tr><td colspan="2">1. STANDARD
The student should be able to efficiently solve and explain academic and daily problems in different contexts, using mathematical reasoning, calculation skills, math terminology, knowledge on set theory, numbers and the numerical system, measurement, solving problems strategies, geometry skills, statistics, and probability.</td><td colspan="3">COMMENT: It is a whole year standard which points to develop content and skills in order to solve daily and academic problems.
Specifies whole year content: numbers and the number system, calculation, measurement, geometry, statistics, and mental math skills.</td></tr>
<tr><td colspan="2">2. BENCHMARK
Argument the steps and strategies needed to solve different types of problems, based on experience with the set theory, numbers and the number system, geometry and using skills to solve basic operations.</td><td colspan="3">COMMENT:
The benchmark points to functional language in order to argument steps and strategies to solve problems. In order to achieve this benchmark, the student should know about argument skills as well as specific math knowledge to support their thoughts.</td></tr>
<tr><td colspan="2">3. CONTENT OBJECTIVES
✓ Expresses great numbers in different ways, demonstrating knowledge of rounding and place value.
✓ Expresses amounts in word name, standard form, and expanded form, using the decimal system.
✓ Performs operations using knowledge about sets.
✓ Uses addition, subtraction, multiplication, and division strategies to solve operations and problems with decimals.</td><td colspan="3">COMMENT:
The content objectives are specific; determine exactly what has to be learned and taught.</td></tr>
<tr><td colspan="2">4. LANGUAGE OBJECTIVES
✓ Describes how angle measures can affect the properties and classification of a figure.</td><td colspan="3">COMMENT:
Although the benchmark points to language, only one explicit language objective is evident.</td></tr>
</table>

5. CONTENT CONCEPTS	COMMENT:
Set theory (review), numbers and the number system: ✓ Explain the concept of set, classify sets in singleton, empty, finite, and infinite, identifying elements in each set and realizing that numbers belong to the infinite set. Use infinity symbol (∞). ✓ Classify whether an element belongs (∈) or does not belong (∉) to a set. ✓ Shows equality in sets (=), understanding that the order of the elements does not affect the equality e.g. A {1,2,3} = B{1,3,2} ✓ Recognize an empty set by its symbol ∅. ✓ Understand the concept of subset ⊆ and proper subset ⊂ ✓ Shows union and intersection in sets (∪ and ∩) ✓ Identify disjoint sets and find the difference between them ✓ Use roman numerals from I to M ✓ Count on and back in steps of constant size, extending beyond zero. ✓ Know what each digit represents in five- and more-digit numbers, using place value for partitioning any number up to a hundred million into hundred million, thousand millions, ten millions, millions, hundred thousands, ten thousands, thousands, hundreds, tens and ones. ✓ Round four- or more digit numbers to the nearest 10, 100 or 1000. ✓ Order and compare numbers up to nine hundred million using the > and < signs. ✓ Recognize and extend number sequences. ✓ Recognize odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000. ✓ Make general statements about sums, differences and multiples of odd and even numbers.	The content points to develop five components: numbers and the numerical system, a review about the set theory, calculation, problem solving skills (which are studied during the whole school year), and geometry

✓ <u>Write great numbers in standard form, word name and extended form.</u> ✓ <u>Differentiate prime and composite numbers</u> **Calculation:** ✓ Know multiplication and division facts for the 2× to 10× tables. ✓ Know and apply tests of divisibility by 2, 5, 10 and 100. ✓ Recognize multiples of 6, 7, 8 and 9 up to the 10th multiple. ✓ Know powers of 10 and exponents. ✓ Find factors of two-digit numbers. ✓ Count on or back in thousands, hundreds, tens and ones to add or subtract. ✓ Add or subtract near multiples of 10, 100, and 1000 e.g. 4387 – 299, or. 5026 – 4998 ✓ Use appropriate strategies to add or subtract pairs of two- and three-digit numbers. ✓ Multiply and divide any number from 1 to 10,000 by 10 or 100 and understand the effect. ✓ Multiply multiples of 10 to 90, and multiples of 100 to 900, by a single-digit number. ✓ Multiply by 19 or 21 by multiplying by 20 and adjusting. ✓ Multiply by 25 by multiplying by 100 and dividing by 4. ✓ Use factors to multiply, e.g. multiply by 3, then double to multiply by 6 e.g. 15 x 6; so 15x3= 45, and 45 + 45= 90 ✓ Double any number up to 100 and halve even numbers to 200 ✓ Double multiples of 10 to 1000 and multiples of 100 to 10 000, e.g. double 360 or double 3600, and derive the corresponding halves. ✓ Multiply or divide three-digit numbers by two- and three digit numbers. ✓ Divide three- and four digit numbers by single and two-digit numbers, including those with a remainder (answers no	

greater than 30). ✓ Start expressing remainders as a fraction of the divisor when dividing two-digit numbers by single-digit numbers. ✓ Decide whether to group (using multiplication facts and multiples of the divisors) or to share (halving and quartering) to solve divisions. ✓ Decide whether to round an answer up or down after division, depending on the context. ✓ Begin to use brackets to order operations and understand the relationship between the four operations and how the laws of arithmetic apply to multiplication. ✓ Know the properties of addition, multiplication, and division. **Geometry:** ✓ Identify line, line segment and ray. ✓ Understand and use angle measure in degrees; measure angles, with a protractor, to the nearest 5°; identify, describe and estimate the size of angles and classify them as acute, right or obtuse. Calculate angles in a straight line. ✓ Identify and describe properties of triangles and classify them as acute, obtuse, right, isosceles, equilateral or scalene. ✓ Identify regular and irregular polygons ✓ Classify 2D shapes into categories based on their properties. ✓ Recognize perpendicular and parallel lines in 2D shapes, drawings and the environment. Problem solving (whole year) ✓ Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations. ✓ Solve single and multi-step word problems (all four operations); represent them, e.g. with diagrams or a number	

line. ✓ Check with a different order when adding several numbers or by using the inverse when adding or subtracting a pair of numbers. ✓ Use multiplication to check the result of a division, e.g. multiply 3.7 × 8 to check 29.6 ÷ 8. ✓ Recognize the relationships between different 2D and 3D shapes, e.g. a face of a cube is a square. ✓ Estimate and approximate when calculating, e.g. using rounding, and check working. ✓ Consider whether an answer is reasonable in the context of a problem. ✓ Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations. ✓ Choose an appropriate strategy for a calculation and explain how they worked out the answer. ✓ Explore and solve number problems and puzzles, e.g. logic problems. ✓ Deduce new information from existing information to solve problems. ✓ Use ordered lists and tables to help to solve problems systematically. ✓ Describe and continue number sequences, e.g. –30, –27, □, □, –18...; identify the relationships between numbers. ✓ Identify simple relationships between shapes, e.g. these triangles are all isosceles because… ✓ Investigate a simple general statement by finding examples which do or do not satisfy it, e.g. the sum of three consecutive whole numbers is always a multiple of three. ✓ Explain methods and justify reasoning orally and in writing; make hypotheses and test them out. ✓ Solve a larger problem by breaking it down into sub-	

problems or represent it using diagrams.	
6. SUBJECT VOCABULARY ✓ Set, element, member, singleton, finite, infinite, belong, doesn't belong, equal, empty set, subset, proper subset, union, intersection ✓ Roman numerals from I to MM ✓ Hundreds millions, tens millions, ones millions, hundreds thousands, tens thousands, ones thousands, hundreds, tens, ones, period, ✓ Greater than >, less than < ✓ Odd and even numbers ✓ Extended form, standard form, word form ✓ Prime and composite numbers ✓ Decimal, decimal point, tenths, hundredths, thousandths ✓ Standard, form, word name, expanded form, ✓ Sequence, term ✓ Round ✓ Properties of addition and multiplication: commutative, associative, identity, distributive. ✓ Base, exponent ✓ Inverse operation, numerical expression, evaluate, order of operations, ✓ Compatible numbers, dividend, divisor, estimate, factor, partial quotient, product, quotient, remainder ✓ Line, segment, ray ✓ Types of angles and triangles: acute, right, obtuse, equilateral, isosceles, scalene	COMMENT: there is specific vocabulary related to the content to be taught during the term.
7. LANGUAGE SKILLS ✓ Explain the concept of set. ✓ Choose an appropriate strategy for a calculation and explain how they worked out the answer. ✓ Describe and continue number sequences, e.g. –30, –27, □,	COMMENT: In order to achieve these goals, the students should develop ability to explain, describe, justify and hypothesize.

□, –18...; identify the relationships between numbers. ✓ Explain methods and justify reasoning orally and in writing; make hypotheses and test them out.	
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 33

Curriculum analysis: 1st term - sixth grade

<table>
<tr><td>RESEARCHER: DIANA PEREZ ALVAREZ</td><td>SCHOOL: GLC</td><td>SUBJECT: MATHEMATICS</td><td>TERM: I</td><td>GRADE: SIXTH</td></tr>
<tr><td colspan="2">1. STANDARD
The student should be able to efficiently use addition, subtraction, multiplication, and division to solve and explain problems in different contexts, involving whole numbers, integers, fractions, decimals, geometry skills, statistics and probability.</td><td colspan="3">COMMENT: In order to achieve the standard it is necessary to develop content as well as language skills in order to solve and explain the problems.
The standard specifies whole year content: operations (addition, subtraction, multiplication, and division); the numerical system (whole numbers, integers, fractions, and decimals), geometry skills, statistics, and probability. There is no measurement in this grade.</td></tr>
<tr><td colspan="2">2. BENCHMARK
The student will use the operations of addition, subtraction, multiplication and division to solve problems that involve whole numbers and integers.</td><td colspan="3">COMMENT:
The benchmark only points to content: use of operations to solve problems involving whole numbers and integers. There is no explicit requirement of language skills.</td></tr>
<tr><td colspan="2">3. CONTENT OBJECTIVES
✓ Explains why integers are an extension of the set of whole numbers.
✓ Uses addition, subtraction, multiplication, and division skills and strategies to solve problems involving whole numbers and integers.
✓ Uses different types of lines and angles to build 2D shapes and polygons, being aware of their properties.</td><td colspan="3">COMMENT:
The content objectives are specific; determine exactly what has to be learned and taught.</td></tr>
<tr><td colspan="2">4. LANGUAGE OBJECTIVES
No language objectives, but the following specific contents lead to develop language skills.</td><td colspan="3">COMMENT:
Language objectives are no evident in the curriculum</td></tr>
</table>

✓ Make and justify estimates and approximations of large numbers. ✓ Write numbers up to billion in standard form, word name and expanded form. ✓ Make general statements about sums, differences and multiples of odd and even numbers. ✓ Describe properties of quadrilaterals (including the parallelogram, rhombus and trapezium), and classify using parallel sides, equal sides, equal angles. ✓ Explain why they chose a particular method to perform a calculation and show working. ✓ Deduce new information from existing information and realize the effect that one piece of information has on another. ✓ Identify relationships between numbers and make generalized statements using words, then symbols and letters, e.g. the second number is twice the first number plus 5 (n, $2n + 5$); all the number are multiples of 3 minus 1 ($3n - 1$); the sum of angles in a triangle is 180°. ✓ Make, test and refine hypotheses, explain and justify methods, reasoning, strategies, results or conclusions orally.	
5. CONTENT CONCEPTS **Set theory (review), numbers and the number system:** ✓ Determine either an element belongs (∈) or does not belong (∉) to a set. ✓ Shows equality in sets (=), understanding that the order of the elements does not affect the equality e.g. A {1,2,3} = B{1,3,2} ✓ Understand the concept of subset ⊆ and proper subset ⊂ ✓ Shows union and intersection in sets (∪ and ∩), complement and difference A^c, B^c…using Venn diagrams	COMMENT: The content points to develop five components: numbers and the numerical system, a review about the set theory, calculation, problem solving skills (which are studied during the whole school year), and geometry

✓ Solves problems related to sets using Venn diagrams ✓ Extend and comprehend sets: the elements that make part of a set; properties of the elements ✓ Use roman numerals from I to MM ✓ Count on and back in steps of constant size, extending beyond zero. ✓ Make and justify estimates and approximations of large numbers. ✓ Order and compare positive numbers up to one billion, using >, < and = ✓ Write numbers up to billion in standard form, word name and expanded form. ✓ Express great numbers as exponents and square roots. ✓ Know what each digit represents in whole numbers up to a billion. ✓ Round whole numbers to the nearest 10, 100 or 1000. ✓ Estimate where four-digit numbers lie on an empty 0 – 10,000 line ✓ Recognize and extend number sequences. ✓ Recognize odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000. ✓ Make general statements about sums, differences and multiples of odd and even numbers. ✓ Recognize prime numbers up to 20 and find all prime numbers less than 100. ✓ Recognize the historical origins of our number system and begin to understand how it developed. ✓ Understand, compare, and order integers, establishing absolute value. ✓ Count on and back in fractions and decimal and repeated steps of whole numbers (and through zero). ✓ Know what each digit represents in one-, two- and third	

place decimal numbers .Round a number with two decimal places to the nearest tenth or to the nearest whole number. **Calculation:** ✓ Multiply and divide any whole number from 1 to 100,000 by 10, 100, 1,000 or 10,000 and explain the effect. ✓ Know and apply tests of divisibility by 2, 4, 5, 10, 25 and 100. ✓ Add/subtract a near multiple of 10, 100 or 1000, or a near whole unit of money, and adjust, e.g. 3127 + 4998; 5678 – 1996. ✓ Use place value and multiplication facts to multiply/divide mentally. ✓ Multiply pairs of multiples of 10, e.g. 30 × 40, or multiples of 10 and 100, e.g. 600 × 40. ✓ Double quickly any two-digit number, and derive the corresponding halves. ✓ Divide three-or four-digit numbers by single-or two-digit numbers, including leaving a remainder. ✓ Add two- and three-digit numbers with the same or different numbers of digits. ✓ Multiply near multiples of 10 by multiplying by the multiple of 10 and adjusting. ✓ Multiply by halving one number and doubling the other, e.g. calculate 35 × 16 with 70 × 8. ✓ Find factors of two-digit numbers. ✓ Find some common multiples, e.g. for 4 and 5. ✓ Use number facts to generate new multiplication facts, e.g. the 17× table from 10× + 7× tables. ✓ Multiply two, three or four-digit numbers (including sums of money) by a single-digit number and two- or three-digit numbers by two-digit numbers.	

✓ Know and apply the arithmetic laws as they apply to multiplication. ✓ Solve problems using powers, logarithms, and square roots ✓ Solve problems using mcm and mcd. **Geometry:** ✓ Identify line, line segment and ray. ✓ Recognize perpendicular and parallel lines in 2D shapes, drawings and the environment. ✓ Classify different polygons and understand whether a 2D shape is a polygon or not. ✓ Identify and describe properties of polygons. ✓ Identify regular and irregular polygons ✓ Describe properties of quadrilaterals (including the parallelogram, rhombus and trapezium), and classify using parallel sides, equal sides, equal angles. ✓ Understand and use angle measure in degrees; measure angles, with a protractor, to the nearest 5°; identify, describe and estimate the size of angles and classify them as acute, right or obtuse. ✓ Calculate angles in a straight line. ✓ Identify complementary and supplementary angles. ✓ Check that the sum of the angles in a triangle is 180°, for example, by measuring or paper folding; calculate angles in a triangle or around a point. ✓ Make angles with given measures using the protractor. ✓ Make 90° angles using the set square or triangle **Problem solving: (whole year)** ✓ Choose appropriate and efficient mental or written strategies to carry out a calculation involving addition, subtraction,	

multiplication or division. ✓ Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations. ✓ Check addition with a different order when adding a long list of numbers; check when subtracting by using the inverse. ✓ Recognize 2D and 3D shapes and their relationships. ✓ Estimate and approximate when calculating, e.g. use rounding, and check working. ✓ Explain why they chose a particular method to perform a calculation and show working. ✓ Deduce new information from existing information and realize the effect that one piece of information has on another. ✓ Use logical reasoning to explore and solve number problems and mathematical puzzles. ✓ Use ordered lists or tables to help solve problems systematically. ✓ Identify relationships between numbers and make generalized statements using words, then symbols and letters, e.g. the second number is twice the first number plus 5 (n, $2n + 5$); all the number are multiples of 3 minus 1 ($3n - 1$); the sum of angles in a triangle is 180°. ✓ Make sense of and solve word problems, single and multi-step (all four operations), and represent them, e.g. with diagrams or on a number line; use brackets to show the series of calculations necessary. ✓ Solve simple word problems involving ratio and direct proportion. ✓ Solve simple word problems involving percentages, e.g. find discounted prices. ✓ Make, test and refine hypotheses, explain and justify	

methods, reasoning, strategies, results or conclusions orally.	
6. SUBJECT VOCABULARY ✓ Set, element, member, singleton, finite, infinite, belong, doesn't belong, equal, empty set, subset, proper subset, union, intersection ✓ Roman numerals from I to MM ✓ Billions, hundreds millions, tens millions, ones millions, hundreds thousands, tens thousands, ones thousands, hundreds, tens, ones, period, ✓ Greater than >, less than < ✓ Odd and even numbers ✓ Extended form, standard form, word form ✓ Prime and composite numbers ✓ Properties of addition and multiplication: commutative, associative, identity, distributive. ✓ Base, exponent ✓ Inverse operation, numerical expression, evaluate, order of operations, ✓ Compatible numbers, dividend, divisor, estimate, factor, partial quotient, product, quotient, remainder ✓ Line, segment, ray, perpendicular, parallel ✓ Rhombus, parallelogram and trapezium ✓ Types of angles: acute, right, obtuse, supplementary angles, complementary angles ✓ Protractor, degrees ✓ Straight line	COMMENT: there is specific vocabulary related to the content to be taught during the term.
7. LANGUAGE SKILLS ✓ Make and justify estimates and approximations of large numbers. ✓ Write numbers up to billion in standard form, word name and expanded form. ✓ Make general statements about sums, differences and	COMMENT: In order to achieve these goals, the students should develop ability to explain, describe, justify and hypothesize. Reading skills are required to infer information in order to solve problems.

multiples of odd and even numbers. ✓ Describe properties of quadrilaterals (including the parallelogram, rhombus and trapezium), and classify using parallel sides, equal sides, equal angles. ✓ Explain why they chose a particular method to perform a calculation and show working. ✓ Deduce new information from existing information and realize the effect that one piece of information has on another. ✓ Identify relationships between numbers and make generalized statements using words, then symbols and letters, e.g. the second number is twice the first number plus 5 (n, $2n + 5$); all the number are multiples of 3 minus 1 ($3n - 1$); the sum of angles in a triangle is 180°. ✓ Make, test and refine hypotheses, explain and justify methods, reasoning, strategies, results or conclusions orally.	
8. SUGGESTED METHODOLOGY	COMMENT: Any suggested methodology to be implemented in the class.

Appendix 34

Analysis from Triangulation

Research question: How is CLIL being implemented by math teachers at GLC in primary levels?					
Secondary questions	**Teacher**	**Conclusions from the observations**	**Conclusions from the interviews**	**Conclusions from the curriculum**	**Analysis of the information**
1. What current methodology do primary math teachers at GLC implement to develop their lessons?	**Glory**	Grade observed: first grade • Varied activities during the lessons • Poor personalization of the content. The activities were mostly taken from the math book. • Scaffolding was used (mostly modeling) and there was individual support to students with difficulties. • Frequent opportunities of interaction teacher /students • There was student/student interaction through	• She is familiarizing with CLIL. She has some notions on CLIL and relates it with context and daily life problems. • She finds CLIL difficult to implement in first grade. • Uses manipulatives or candies to teach the math content • Finds CLIL as a useful tool to ease math learning.	• No methodology suggested for teaching mathematics in first grade.	• Although Glory is recently learning about CLIL, she attempts to include some aspects of this methodology in her lessons. • Glory requires training in CLIL, especially in contextualization or personalization of content, more varied scaffolding activities, and consolidation of content.

		games and while checking homework • Students had plenty of time of respond to input. • The students were engaged during the lessons. • There was feedback when checking homework. Mostly peer's feedback between the students. • Appropriate pace for the students' age and level. • There was an attempt to consolidate learning with a wrap-up session at the end of the second class observed. • Good opportunities for assessment.			
	Betty	<u>Grades observed: second and third grade</u> • The teacher checked prior knowledge to help the students make associations.	• Somehow familiar with CLIL. Recognizes that there are some stages in a CLIL	No methodology suggested for teaching mathematics in second or third grade.	• Betty needs to learn more about CLIL in order to understand the basis of the methodology and

		• Activities mostly taken from the math book. Almost no personalization of content. Mostly decontextualized from the reality of the students. • Scaffolding activities (mostly modeling) and students' support evident during the lessons. • Frequent opportunities of interaction teacher/ students. • More interaction student/ student is required in second grade. • Plenty of time to respond to input. • Students were engaged during the lessons. • Appropriate pace for the students' age and level. • In second grade there was evidence	lesson. • Recognizes some CLIL strategies such as motivating activities for engagement, scaffolding, and consolidation activities. • Mostly identifies CLIL as fun activities for learning. • Implements modelling as scaffolding. • Understands assessment beyond summative assessment • Uses peer's feedback as a strategy for assessment. • Recognizes CLIL as a useful tool for teaching mathematics. • Recognizes that CLIL is a learner		work more intentionally to help the students develop processes and lifelong learning. • As she is somehow familiar with CLIL, she attempts to use some strategies such as checking prior knowledge to make learning associations, scaffolding (mostly based on modeling), positive feedback (mostly peer's feedback), and an attempt to consolidate content learning. • Although Betty recognizes CLIL as a student centered methodology, her lessons pointed more to individual work

		of peer's feedback, but in third grade more feedback was required. • Somehow there was an attempt to consolidate knowledge in a wrap-up activity, especially in second grade. • In general, the activities developed during the lessons were good opportunities for assessment.	centered methodology.		centered on solving problems in the math book.
	Patty	<u>Grades observed: fourth, fifth and sixth grade</u> • Varied activities during the lessons. • Except for the second lesson observed in sixth grade, in which there was personalization of learning, there was little personalization and contextualization of content in most of	• Recognizes CLIL as a worldwide methodology which fosters the students' confidence. • Recognizes CLIL as a learner centered methodology with a variety of teaching strategies. • Patty finds CLIL useful for	No methodology suggested for teaching mathematics in fourth, fifth or sixth grade.	• Patty has more awareness of the nature of CLIL. She handles some concepts such as variety of activities, scaffolding, team work, feedback, and time management. • Patty needs to work in contextualization or personalization

		the classes. The majority of the activities were taken from the book and there was no connection between the tasks and the context of the students. • Scaffolding and students' support evident during the lessons. • Frequent opportunities for interaction teacher/students. • Good opportunities for team work in fifth and sixth grade. • Plenty of time to solve the tasks and respond to input. • Students were engaged during the lessons. • Appropriate pace for the students' age and level. • Good opportunities for feedback during	teaching mathematics and science. She remarks some advantages of CLIL such as time management and variety of activities that keep the students working all the time. • Emphasizes some stages of the class: warm up, students work either independent or group work, and peer's feedback. • She did not mention consolidation of learning. • Patty evaluates language as well as the content when assessing word problems; however she gives more relevance to			and consolidation of learning. • She gives more relevance to content than to language.

		the lessons. Mostly peer's feedback. • Mostly lack of consolidation of knowledge at the end of the class. • Mostly good opportunities for assessment during the lessons.	content than to language.		
2. How is general language focused in current math lessons at GLC's primary level?	Glory	Grade observed: first grade • No evidence of language objectives during the lessons • The teacher provided language support during the lesson by telling the students how to say some expressions in English when they talked in Spanish. • Students' interaction with the teacher and classmates was mostly in Spanish; although the teacher spoke in English to the students all the time. • There was some	• Glory mentioned that her students spoke in English all the time. • Provides vocabulary support to foster listening and speaking. • Recognizes speaking as the skill more developed in the math lessons. • Uses drawings and explains the meaning of new words to help students understand word problems. • Glory stops the	• The curriculum does not have any specific category in which language objectives can be clearly identified in first grade. ✓ Some outputs within the content could be considered as language objectives due to the purpose they aim to achieve and the functional language	• Glory provides language support to help the students learn vocabulary or say expressions in English. It is mostly language through learning. • Glory needs to be aware of the importance of language objectives to successfully foster language skills required to improve understanding. • Glory needs to be trained on how to use language

		emphasis in reading (problems) and speaking to solve problems orally. The students mostly wrote addition and subtraction sentences. Listening took place during the interaction teacher / students.	lesson to explain grammar to the students to improve understanding. • As glory also teaches other subjects in English, she supports the grammar with other subjects, too.	required in order to carry out some tasks. For example: “Describes 2D and 3D shapes, determining the number of sides and vertices, faces, types of faces and how they move.”	skills and functional language as tools to support the learning of the content. • There was a mismatch between the observations and what Glory mentioned in the interview. Students do not speak in English all the time as told in the interview.
	Betty	Grades observed: second and third grade • No evidence of language objectives at any of the four observations. The lessons were mostly content centered. • Students attempted to address to the teacher in English. • Student/ student interaction was	• She understands language skills as using subject vocabulary to communicate with others, probably for academic purposes. • No clarity about functional language. • Provides support	• The curriculum does not have any specific category in which language objectives can be clearly identified in second or third grade. • Some outputs	• In order to develop CLIL lessons, Betty needs to be aware of the importance of achieving language objectives necessary to make math lessons more meaningful. • Betty needs to

		mostly in Spanish • There was some emphasis in reading (problems), writing (solution of the problems) and speaking. Listening took place during the interaction teacher / students and somehow student/student.	to help the students learn new vocabulary. • Students use a mixture between English and Spanish to communicate. • No evidence of developing reading, writing or listening skills; she just aims at improving speaking. • Scaffolds word problems to help the students understand vocabulary • Models with an example to help the students read word problems. • Explains some grammar in the math lesson when required. • Works projects with language arts to support language.	within the content could be considered as language objectives due to the purpose they aim to achieve and the functional language required in order to accomplish some tasks. Example: “explaining methods and procedures and writing a number story to go on calculation in second grade and third grade”.	learn about communicative skills and how to implement them to teach the content and foster the use of English during the class. • Betty needs to implement other strategies to teach general language, such as context clues or suffixes and prefixes. • Most of the language worked in Betty’s lesson was language through learning.

			• Uses dictionaries and glossaries to teach vocabulary and teaches clue words for different operations as language support to solve word problems. • Only refers to explaining the meaning of new words in the vocabulary notebook. Context clues should be implemented. • Modeling as teaching strategy for functional language and writing word problems. • Evaluates language when assessing writing word problems.		
	Patty	<u>Grades observed: fourth, fifth and sixth grade</u> • Mostly no evidence	• Focuses language learning in language through	• The curriculum does not have	• Patty has some awareness of the importance of

		of language objectives in most of the lessons observed. In the second observation of sixth grade, the language objective was easily inferred during the lesson. • Students interacted between them in English when the teacher encouraged them. • Language skills were developed during the lessons. Mostly reading, writing (in order to solve problems), and speaking (to explain reasons to support answers). Listening took place mostly during the interactions teacher/ student and student/student.	learning. She mostly gives input to the students to learn vocabulary or grammar when it is required at the moment of speaking. • There is no planning of language activities. • Math lessons mostly foster speaking. • Patty encourages the students to speak in English during the lesson. • Listening only takes place during the interaction teacher/student or student/student • Patty did not mention reading or writing as possible skills to develop the learning of the content.	any specific category in which language objectives can be clearly identified in fourth, fifth or sixth grade. • Some outputs within the content could be considered as language objectives due to the purpose they aim to achieve and the functional language required in order to accomplish some tasks. Example: explaining concepts, describing the position of a square in the coordinate plane,	language in understanding mathematics; however, she needs to establish concrete language objectives in order to provide more tools for understanding and engage the students to speak in English between them. • Patty mostly focuses language in language through learning. • Patty needs to be more aware of the implementation of communicative skills as a medium to teach the content.

			• Patty allows the students to use Spanish when they are working in groups, between them, but it is a must in Patty's lessons to present work in English. • Uses strategies such as asking for students' prior knowledge, dictionaries or context clues to learn the meaning of a new word. • Explains grammar only when it is a difficulty to understand word problems. • For writing word problems, Patty explains the structure and style required to write word problems, checking	explaining reasons for choosing multiplication strategies, and describing number sequences in fourth and fifth grade and explaining methods, justifying reasoning, orally as well as written and making and testing hypothesis in fifth and sixth grade.	

			agreement, cohesion and coherence of the word problem.		
3. How is subject academic language being focused in current math lessons at GLC's primary level?	Glory	<u>Grade observed: first grade</u> • No evidence of introduction of subject vocabulary during the lessons. • There was emphasis of previously learned subject vocabulary (numbers and signs) during the lessons. The teacher encouraged the students to use the vocabulary during the lessons. • There was review of key vocabulary. • Good opportunities to use math language during the lessons.	• Attempts to help the students use some subject vocabulary. • She helps students make associations of key vocabulary with mathematical signs.	• There is specific vocabulary to be taught in first grade during the first term.	• Glory recognizes the importance of subject vocabulary in the class and provides opportunities to use it in class. • Besides the vocabulary notebook, Glory should display visuals, images or written subject vocabulary to help the students familiarize with new words.
	Betty	<u>Grades observed: second and third grade</u> • No introduction of subject vocabulary at any of the lessons observed.	• She understands the importance of subject vocabulary in order to understand	• There is specific vocabulary to be taught in second and third grade	• It was not possible to confirm the information given in the interview about

		• In general there was review of key vocabulary previously learned. • Good opportunities to use math language in second grade, but little chances in third grade.	problems and solve them. • She learns and teaches subject vocabulary. • Introduces vocabulary through games and glossaries. • The students write new vocabulary in a notebook. • Uses the glossary in the math book to teach subject vocabulary.	during the first term.	introduction of new vocabulary in the observations. • Betty knows the importance of knowing subject vocabulary for understanding and for learning; however, she should implement other strategies such as bingo games or she should display words in a type of math corner to support subject vocabulary.
	Patty	<u>Grades observed: fourth, fifth and sixth grade</u> • There was no evidence of introduction of subject vocabulary, but there was emphasis of previous learned vocabulary and review of key vocabulary during	• Introduces subject vocabulary by matching words, definitions and examples. • Relates prior knowledge with new vocabulary, and then the students build up meaning of the new words.	• There is specific vocabulary to be taught in fourth, fifth, and sixth grade during the first term.	• It was not possible to confirm the information given in the interview about introduction of new vocabulary in the observations. • Patty provides opportunities to

			the six lessons observed. • Frequent opportunities to use math language during the lessons	• Uses the glossary in the math book to teach subject vocabulary		review and use subject vocabulary.
4.	How is content focused in on current math lessons al GLC's primary level?	Glory	Grade observed: first grade • The content objective was implicit in both lessons. • Appropriate content for the age and level of the students. • Clear and intentional explanation of content. • Frequent opportunities to demonstrate content knowledge during the lessons.	• Uses manipulatives or candies to teach the math content • Recognizes motivation as an indicator of learning the content. • To teach content such as the description of shapes, Glory asks students to observe shapes and supports them with clue words to help them describe given shapes. • Although first graders do not write word problems yet, they make their own problems by	• The yearly standard and the benchmark for the first term is mostly based on content in first grade. • There is a classification of content which points to develop four components: numbers and the numerical system, the set theory, calculation, and geometry.	• Glory needs to be intentional in her content objectives since the students need to be aware of what is expected from them to learn. • Glory mostly based her teaching in content. • Glory uses varied activities to foster content learning.

			drawing a situation and using manipulatives.		
	Betty	<u>Grades observed: second and third grade</u> • The content objective was implicit in the fourth observations. • Appropriate content for the level and age of the learners. • Clear and intentional explanation of content. In third grade it was mostly review of content. • Frequent opportunities to demonstrate content knowledge during the lessons.	• Betty gives relevance to modeling as a strategy to teach the content. • She uses other strategies such as the problem of the day, pair work, team work and whole class to teach the content. • She implements Peer's feedback as strategy to verify content learning. • Encourages students to work challenging content such as writing word problems by modeling. • Students write their own problems using	• The yearly standard and the benchmark for the first term is mostly based on content in second and third grade. • There is a classification of content which points to develop five components: numbers and the numerical system, the set theory, calculation, problem solving and geometry.	• Betty needs to work in having clarity in the content objective to be achieved in each lesson. Objectives must be intentionally shown to the students in order to help them know what is expected for them to learn during the lesson. • Betty gives much relevance to the content; actually her lessons are mostly based on content. • Betty should promote more teamwork and projects to make content more meaningful for the students.

			the teacher's model. • Students just limit to imitate the teacher's word problems.		
	Patty	<u>Grades observed: fourth, fifth and sixth grade</u> • Implicit content objectives easily inferred during the lessons. • Appropriate content for the students' age and level. • Clear and intentional explanation of content through different activities. • Frequent opportunities to demonstrate content knowledge.	• She mentioned that she uses CLIL to teach the content of mathematics but she did not mention any concrete CLIL strategy to teach the content. • Patty basically explained that to teach the content she works vocabulary, explains the content, work in the text book (which she considers a very good tool), the notebooks or worksheets. • Teacher or peer's feedback is patty's evidence	• The yearly standard and the benchmark for the first term is mostly based on content in fourth and sixth grade. • The benchmark in fifth grade seems to be focused in language but with a strong support in content. • There is a classification of content which points to develop five components: numbers and the numerical	• Patty needs to be more intentional with her content objectives, since although they can be inferred during the lesson, the students are not aware of what is expected for them to learn in each lesson. • Patty lessons are mostly centered in learning the content. • Patty challenges her students to achieve ability to solve complex content tasks.

			of learning the content. • Models word problems for the students; when the students make their own problems, they mostly take the teacher's model and make minimal changes. • Encourages and supports the students to write complex word problems. • Provides input by using questions in order to help students carry out challenging tasks such as describing the properties of a shape. • Use graphic organizers to scaffold content.	system, the set theory, calculation, problem solving and geometry.	

General analysis:

- The teachers need to be intentional with the language and learning objectives to be achieved during the lessons. Objectives must be shown to the students in order to avoid limiting language learning only to language through learning.

- To make real CLIL lessons, teachers have to be intentional in achieving language objectives; although teachers mostly speak in English to the students and encourage them to communicate in English, it is necessary to have clear language objectives to foster students' use of the language.
- There is no evidence of language of learning or language for learning.
- There should be explicit language objectives in the curriculum to guide the teaching.
- Most of the lessons are only focused on content, reducing the possibilities to foster language learning.
- Tasks must be contextualized in order to create meaningful learning opportunities.
- The teachers recognize the importance of scaffolding and students' support to improve opportunities of learning; however scaffolding is mostly reduced to modeling.
- Language scaffolding such as context clues for vocabulary should be implemented to solve word problems.
- The teachers should provide more opportunities for team work and projects in the lessons. Most of the activities were based in tasks from the book.
- Consolidation of learning is required to make an effective CLIL lesson, however in most of the class observed the teachers did not have time to wrap-up the lesson
- Teachers need to learn about language and language skills in order to focus the lessons in a better way.
- Subject vocabulary should be display in the classroom to help the students familiarize with the new vocabulary.